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TO STRENGTHEN THE ARMS.

By RICHARD A. PROCTOR.

THE SHOULDERS AND UPPER ARM.

(*Continued from page* 496.)

FLINGING the hammer, or any other weight which can conveniently be flung hammer-fashion, is capital work for the muscles of the upper back, and the inner portion of the triceps, while the weight is being swung backwards; in delivering the weight by swinging it upwards and forwards, the muscles over the shoulder and the deltoid are brought into play still more effectually.

Exercises in which the arms are flung horizontally backwards are good for the muscles at the sides of the shoulder. The action in delivering the broadsword cuts five and six is what is specially to be aimed at for these muscles. These cuts as delivered in the cavalry sword exercise—in which the body is swayed over (the legs somewhat apart) to the right in delivering cut five (from right to left) and to the left in delivering cut six (from left to right), while the body is held vertically in delivering cut seven (downwards, as the enemy's crest)—are still more useful for developing the shoulder muscles. In fact the whole of the cavalry broadsword exercise, as practised on foot, the legs a little apart and the body swaying from side to side between cuts one and two (slantingly downwards), between cuts three and four (slantingly upwards), and between cuts five and six (horizontal), is splendid for the right upper arm and shoulder. It comes rather awkwardly at first to most persons to go through the same exercise with the left arm; but after a while it is easy enough; and undoubtedly both arms should be exercised equally in this way, if symmetry of development is required. It affords good exercise to go through the broadsword exercises both for infantry and cavalry, with a light club, say six pounds, instead of a broadsword, first with one arm, then with the other. It is particularly hard work to check stroke seven at the right time, if it has been given with the full swing of the club.

Rowing is a good exercise for the shoulder muscles, but tends to round the shoulders forward, and should be corrected by the frequent use of exercises such as those just described. The same remark applies to lifting work, which is apt to injure the shapeliness of the back. There is good work for the shoulder muscles in gardening, also, but it must be corrected by work tending to throw the shoulders back. Swinging the clubs well back so that in their swing they come almost to touch the calves, as already described for another purpose, is an excellent corrective for all such forms of exercise as tend to warp the shoulders forward.

For the deltoid muscles, over the top of the shoulder, there is no better exercise than climbing up a rope. But this work, like that of drawing the body up to a cross-bar, is too severe for the lax muscles of the untrained. It should be preceded by steady work, uplifting weights by a downward pull, as by hauling on a rope passed over a pulley or a horizontal bar overhead. You can make half your weight serve for lifting practice by sitting on a crossbeam attached to a rope which passes over a pulley. Hauling on the free half you seem to lift your whole weight; but in reality you only lift half, though you raise the whole. This may sound somewhat paradoxical, but if you consider how when thus raising the body by hauling on a rope the weight is divided equally between two portions of rope, one held by the hands the other attached to the cross-bar on which you sit, you will see that the hands sustain in reality but half your weight. Note also the evidence derived from the rate at which the body rises. If you haul in two feet of rope the supporting rope is shortened by two feet, but this shortening being equally divided between the two portions of the rope, each is shortened one foot which is the distance by which the body rises. By practising on the half weight daily you will soon be able to lift the whole weight as in climbing. If, however, you have opportunities for either exercise, be very careful when hauling up the weight by a rope passing over a pulley that the rope is of adequate strength, and that it runs truly and freely over the pulley: a hitch when you are several yards above ground is an awkward and annoying *contretemps*.

A man in good condition ought to be able to lift his body steadily by the action of the arms till the chin touches the knuckles, then lowering himself, then raising himself again, and so on, ten or twenty times. With practice and training, one arm will lift the body easily. Athletes can lift the body from a single finger; but those for whom I am writing may be content without achieving that feat.

Holding out weights at arms' length, in front and on either side, and swaying weights (dumb-bells preferably) from the front to either side, the arm remaining all the time horizontal, will be found good exercise for the muscles on the front and side of the shoulder. Putting up a weight from the shoulder is better exercise for the arms than for the shoulder muscles; but is good for correcting the effects of too much exercise in lifting weights.

Boxing and single-stick are alike excellent for the shoulder and upper arm muscles. Broadsword and single-stick with the hanging-guard, now always used in England (in America the old-fashioned inside guard is still in vogue), are better for this purpose than fencing. But all such exercises are good for the shoulder muscles. It is a pity they are one-sided, though that can be corrected at the will of the players.

(*To be continued.*)

THOUGHT AND LANGUAGE.

By ADA S. BALLIN.

XI.

THE study of the development of gesture language in the deaf-and-dumb is of peculiar value in regard to language in general, because every deaf-and-dumb child to

a certain extent creates his own language, and we can therefore observe its growth.

There is a widespread but very erroneous belief that deaf-and-dumb children are inferior in mental capacity to other children. This belief probably arises from the fact that there are children who are dumb from deficient intellect; those who are dumb from the loss of hearing are, however, usually as clever as other children of their age. They live in a world of their own from which all sounds are cut off, a world of sights and touches, tastes and smells; and as far as their senses can be utilised they make use of them, and are keener observers than others, because they can only trust to their own observations. Whatever questions may arise in their minds they have to solve for themselves, while their hearing and speaking brothers and sisters are too often content to accept hearsay evidence instead of reasoning for themselves. The knowledge of the untaught deaf child is limited to his own crippled sense impressions; he can know of nothing which he has not actually experienced; whereas a hearing child in the language it learns is presented with a whole system of philosophy, the stored-up learning of countless generations.

The deaf infant makes its wants known instinctively by cries and other signs, precisely in the same way as an ordinary infant. As it grows older its sensations are expressed like those of other children. We can tell by its actions whether what it touches, smells, or tastes is pleasant or unpleasant, and if what it beholds causes it astonishment, fear, or pleasure. The natural expressions called forth by certain feelings are interwoven in the child's mind with the things and actions which cause them, and become in time signs of these things and actions, so that the expressions may be assumed for purposes of communication. The facial expression of the deaf mute plays the same part in his language as the tone of voice in which a hearing person speaks. The deaf child imitates nature and its parents in actions, the hearing child in sounds as well as actions. All congenitally deaf children use the same natural sign for expressing the same idea. They manage to make themselves perfectly understood by pointing at things, while, when the objects of discussion are out of sight, they describe them pictorially. When thirsty, the deaf child touches its throat and stomach, and acts as if gulping down liquid. If its head aches, the hand is pressed to the painful part. A man who had been marked by smallpox is mentioned by touching the face at various points with the tip of the forefinger. These children make themselves a language which all have in common; but it depends on the intelligence of the individual and on its surroundings how far this shall be developed in his case; the more intelligent a child naturally is, the more characteristic and special is the sign which he adopts to convey his meaning to others. The deaf child's dictionary is made up of aspects and movements. For him the cat is the animal that scratches, an attribute common to all cats; the worm is the wriggler; the bull, the tosser; the bird, the flyer; the stick, the striker; the tailor, the sewer; the oven, the thing that makes you draw your hand away quickly. Thus movement is what first and most powerfully impresses him; but he soon begins to distinguish colours. To express his appreciation of them, he falls back upon his early impressions, by which colour was associated with certain familiar objects; thus anything *red* is like the lip, *green* like grass. Form is described by movements of hands and arms; for *round*, a circle is made in the air. To express *tree*, the child stands up stiffly, with his arms stretched out for branches. Some characteristic part is frequently taken to signify the whole thing; for *donkey*, the hands are held upon each side of the head, to show that it is "the animal with long ears." Five fingers placed in a group may be used to mean a bundle of sticks; the hand held flat before the face means *mirror*; while one finger held up straight is a candle. The deaf child makes up his language from his various observations of nature, animate and inanimate, and the origins of his signs or names may be classified as follows:—

1. The characteristic movements of the objects, as peacock—the animal that struts.

2. The uses to which the object is put, as butter—what is spread on bread.

3. The occupation of the person indicated: doctor—the man that feels one's pulse.

4. Representation of actions to which certain things are habitually subjected: money—that which is counted out.

5. Representation of the effects produced on men and animals by the objects: the sun—what makes one blink; pepper—what makes one sneeze; brandy—what makes people drunk, the characteristic rolling about being imitated, after the sign of drinking has been made.

6. Individuals are represented by characteristic marks: at one school for the deaf at which I visit one of the teachers who has a prominent nose is always indicated by the sign for a large nose, the child applying his hand to his own. One man is the "fat man," another the "thin."

7. In a similar way, names are applied to classes having similar characteristics: A criminal is the man whose hands are bound; a clergyman—the one who wears a white neckcloth and long coat.

8. The manner in which things are prepared for use: a match is indicated by imitating the action of striking one; wine by acting as if pouring it out, and drinking it with a smack of the lips.

9. The form or appearance of things is shown: for *windmill* the shape of the building is shown with the hands and the action of the sails with the arms.

10. People and things are represented by the places in which they are generally found: hat—what is put on the head; sword—what hangs by the side; grandfather is mentioned by pointing to his chair.

Curiously enough, deaf children frequently indicate animals by imitating their characteristic sounds. By imitating those movements of the vocal organs which in the animal produce these sounds, they themselves reproduce them, although unconsciously, since they have no idea of what we call sound. Upon this peculiarity is based, to a great extent, that admirable system of teaching "the dumb to speak," to which I hope to refer hereafter. A case of great interest in this connection is mentioned by Eschwege,* who, speaking of a rest during a journey in the interior, says:—"I was occupied the rest of the day in quail-hunting and in making philosophical observations on a deaf-and-dumb idiot negro boy about thirteen years old, with water on the brain, and upon whom nothing made any impression except the crowing of a cock, whose voice he could imitate to the life. Just as people teach the deaf-and-dumb to speak, so this beast-man, by observing and imitating the movements of the neck and tongue of the cock, had in time learnt to crow, and this seemed the only pleasure he had beyond the satisfaction of his natural wants. He lay most part of the day stark naked on the ground, and crowed, as if for a wager, against the cock."

The deaf-and-dumb child qualifies things and their conditions in the same way as he names the objects themselves. Of adjectives of colour and form I have already spoken.

* "Brasilien," Part I., p. 59.

Size he describes by measuring with his hands and arms, or marking, as it were, on his own body the length, breadth, or thickness of the object in question. Movement and direction are shown by drawing a line with one finger along the left arm. *Hollow*, he feels with the index and middle finger of the right hand in the hollow of the left with an inquiring look; for *flat* he moves the same fingers over the inner surface of the left hand, which he holds flat. *Smooth*, the fingers of the right hand are moved quickly to and fro over the back of the left with a pleased expression. For *rough* they are scratched over it, as if with difficulty. *Stiff*, the arm and fingers are held as if stiff, or an action is made as if breaking a stick in both hands, with a fear that splinters may fly in the face. *Empty*, the hollow of the left hand is made to represent a vessel, which is turned once or twice, the right index is pointed into, and the head shaken. For *wind*, *windy*, the deaf mute blows into his right hand. For *straight*, a straight line is drawn in the air. For *crooked*, a crooked one. *Dry*, the action of powdering a very dry plant between the hands is imitated. *Much*, the hands are brought together several times in the air, as if holding a quantity of something. *Little*, the tips of the thumb and index of the right hand are rubbed lightly together. For *old*, wrinkles are traced on the face; whereas *young* is indicated by the apparently smooth chin being felt with the finger and thumb of the right hand, and a cheerful look. For *hard*, the right fist is struck on the knuckles of the left hand; while for *soft* the ball of the left thumb is touched with the right index. *Heavy* is mentioned by the apparent attempt to lift something beyond one's strength; for *light*, the movements of raising something easily are imitated with a smile. For *ill*, the pulse of the left hand is felt with the right, and the face expresses trouble. Well, cheerful, pleased, sorry, unhappy, repentant, and all other shades of feeling, are, as I have already said, indicated by the facial expressions which ordinarily accompany and are produced by them. When the adjective *strong* is required, the fists are clenched and the muscles made tense, with the figure erect; while *weak* is shown by a general relaxation of the muscles. *Cold* is, of course, expressed by a shiver; but a more complicated gesture is used for *warm*. The deaf-mute breathes into the hollow of his right hand, which is then rubbed gently on the right cheek, while an appearance of well-being is simulated. For *hot*, however, imaginary perspiration is wiped from the forehead with the right hand with an appearance of discomfort.

GREAT WAVES.

By RICHARD A. PROCTOR.

CAPTAIN PARSELLE, of the White Star steamship *Adriatic* (if any ocean steamship can be still described as belonging to any company and not chartered by the British Government), has related recently some surprising experiences of his own in regard to great sea waves. He properly explains, by the way, that it is absurd to speak of the great wave which recently struck the *Germanic*, of the same line, as a tidal wave, though he seems somewhat in the dark as to what a tidal wave really is, describing as a purely tidal wave one which he once saw running up the mouth of the Ganges, which probably was not a tidal wave at all. Moreover, he says "meteorologists (!) describe tidal waves as waves only occurring in bays, firths, and rivers, so situated as to be peculiarly susceptible to the influences of the moon and of gravitation," which is incorrect. A tidal wave is a wave raised by the gravitational action of the sun or moon, or both, and is only *noticeable* at shore lines, when the varying height of the water can be recognised; but tidal waves traverse the whole ocean. The term is applied incorrectly to any wave running in on a shore line, though some waves so observed have had their origin in subterranean disturbances, as in the case of the great waves which traversed the Pacific and Southern Oceans, after the Peruvian earthquake in 1869. Of course, the use of the term tidal wave in regard to waves such as struck the *Germanic* in mid-ocean, is still more improper, because while a sea wave running in on a shore-line does, in that respect, resemble a true tidal wave, a wave encountered in the open ocean cannot by any possibility be of tidal origin. As Captain Parselle explains, such monstrous waves as are occasionally encountered in great storms result from the casual combination of several great wave disturbances into one. He gives the following account of a tremendous wave which he himself encountered. The time was evening. He was a few hours out from London in the English Channel, in a 900-ton ship, of which he was the chief officer. The sky was murky, but not absolutely cloudy, and the Channel waters were calm, though there was a fresh breeze blowing from the west at such a rate as to compel them to sail under a reefed mainsail and double-reefed topsails. On their lee was a brig. "My captain and I," says Captain Parselle, "were standing on deck. I had given orders for the watch to be called, and they were then assembled on the poop deck. The captain said, 'Mr. Parselle, I think the lighthouse ought to be visible by this time,' meaning the Eddystone. 'Suppose I go aloft and look,' I answered. I went up the rigging till I got about 60 feet aloft, and suddenly, when just in that perilous position, I heard a terrible shout from the deck. I looked down to see what was the matter, and just as I did so a mountain of water struck us amidships. It picked me right off my feet, and hurled me clean through the rigging, and flattened me against the mast, whence I fell into the maintop. The rest of what happened I discovered after my recovery. The wave took off every strip of rigging and canvas, all the yards, boats, and arms, and left the ship with only her masts standing. We ran back to the Isle of Wight, and anchored in the Solent to ascertain the extent of the damage, and then we discovered the most wonderful thing of all. The ship had been sheathed with copper, and that wave had stripped its top sheet off for eighty feet of the ship's length, and just as clean as a mechanic's shears could have done!" The brig which had been lying to leeward had been stripped clean to the deck, masts and all—as clean as if an army of carpenters had been at work. The watch had been swept overboard, and every man of them lost. A sea wave such as this is as distinct from the sea waves ordinarily encountered as a cyclone from an ordinary wind storm.—*Newcastle Weekly Chronicle.*

IN freshly-fallen hailstones in the department of the Loire, M. Boussingault has observed a temperature of −10·3°, while that of the surrounding air was 26°. Other observers have noted temperatures of −9°, −4°, and −2°.

THE Stokes-Watson Spark apparatus for showing the combustion of metals under the microscope, by the passage of the electric spark through them, made by Messrs. Watson & Sons, of High Holborn, from the design suggested by Professor Stokes, was exhibited by Messrs. Watson at the Conversazione of the Royal Society, Burlington House, on May 6, and again by them on Friday, June 5, at the Royal Institution. It is a most interesting apparatus, the different metals in combustion showing most beautiful colours, and, as the apparatus can be added to any ordinary microscope, no doubt it will become very popular.

XUM

OUR HOUSEHOLD INSECTS.

BY E. A. BUTLER.

COLEOPTERA (*continued*).

BELONGING to the same family as the Bacon Beetle, are a few other insects that sometimes augment our household fauna. One of these, called *Attagenus pellio* (Fig. 1), is very much like a small *Dermestes*, both in form and in life history. It is a black insect, about $\frac{1}{3}$ inch long, with a small but bright white spot (composed of hairs) nearly in the centre of each elytron, and also three similar but less brilliant ones on the hinder edge of the thorax, of which the centre is the most conspicuous. There is also usually a slight indication of a second and much smaller spot on each elytron, placed nearer the thorax and more at the side than the two bright silver points before alluded to. Of course, all these spots, being simply composed of hairs, easily become obliterated by the wear and tear of life, friction against obstacles causing their speedy abrasion.

Fig. 1. Attagenus pellio.

This insect is of very similar habits to a *Dermestes*, and in domiciling itself with us may generally be regarded as being engaged in fur-hunting. The name "pellio," which is Latin for a "furrier"—a preserver of and dealer in furs—is somewhat contradictorily given to this destroyer of such wares. Linné, who says that it will sometimes entirely strip a fur garment of its hair, accuses it also of attacking the household stores of food, and, besides this, it is occasionally a nuisance in natural history collections, and has sometimes eaten holes in carpets. Its larva is closely covered with reddish-brown hairs, which give it a shining, silky appearance, and it has a long brush of hairs at the tail.

Our last representative of this family is a much smaller insect, which has nevertheless rendered itself notorious by its invasion of museums—a fact, the memory of which has been perpetuated in the second half of its name, *Anthrenus musæorum*. It is a short, oval insect, about one-twelfth of an inch long, prettily sprinkled with variegated scales, which give it a mottled appearance, the pale ones on the elytra being distributed in three more or less distinct, irregular, transverse bands. The scales are pretty objects for the microscope. They are triangular in shape, and, of course, attached by the apex of the triangle, and their principal colours are very deep brown and pale yellowish white. On their removal, the whole insect appears black.

In the power of feigning death, by bending the head under and packing up the legs (Fig. 2), this insect is quite equal to the most obstinate of its allies. The larva is hairy, like that of *Dermestes*, but, of course, much smaller. Its hairs are in bundles, and at its tail are a pair of tufts of larger size; when it is at rest, these two are laid along the back, but when disturbed it erects them, and spreads them out like a couple of shuttlecocks. On account of its hairy nature it is a very slippery creature, and this, combined with its small size, makes it a difficult captive to hold, and enables it easily to slip between the fingers. It is nearly a year in attaining its full size, though not equally vigorous during the whole time: it is much more active in summer than in winter, and feeds chiefly during the warm weather. At length, after several moults, the time for pupation arrives; the last larval skin, however, is not thrown off as its predecessors have been, but, a slit having been made down the back, the insect becomes a chrysalis inside the hairy shroud, from which, on attaining its final form, it makes its exit at the aforementioned slit, leaving its last two coverings one inside the other.

Five species of *Anthrenus* are known as British, and it is curious that the perfect insects frequent living flowers, especially those of the Umbelliferæ, in which they may sometimes be found gregariously. The *larva* of *A. musæorum*, however, feeds upon skins, hairs, feathers, and other dried remains of animals, though it is difficult to understand what temptation there can be for an insect's taste to oscillate between fragrant and aromatic flowers on the one hand and evil-flavoured and malodorous animal remains on the other. Apparently, however, it is not much affected by smells, for the powerful odour of camphor, which is destructive to many insects, seems not to incommode it at all; and, therefore, the keeper of natural curiosities will not permit himself to be deluded into the persuasion that all must necessarily be right with his collections if he has but applied camphor to them after the usual manner. This is no effectual preservative against *Anthrenus*; in fact, the wretched little creature has actually been found snugly nestling under the very camphor that had been inserted for its destruction, in utter scorn of all such precautions. Its smaller size, too, renders it a more difficult enemy to guard against than *Dermestes*, as it can both enter through smaller interstices and is less conspicuous, though not less destructive when once an entrance has been effected.

Fig. 2. Anthrenus musæorum, as it appears when feigning death.

Fig. 3. Mycetæa hirta.

Still keeping to the great section of the Clubhorns, we come now to a minute insect called *Mycetæa hirta* (Fig. 3). This little creature has been at times bandied about from one family to another and its true location is difficult to determine. It is only $\frac{1}{16}$ in. long, of a pale chestnut colour, with rows of large and deep (comparatively) pits or "punctures" on the elytra (the word punctures, as used in entomology, does not imply complete perforation, but merely indicates sudden and minute depressions, usually circular in form); the whole surface of the insect is beset somewhat scantily with long coarse hairs, which stand out like a *chevaux-de-frise* all over its body, and have gained for it the name of *hirta*, "hairy." The thorax seems as though its lateral edges had been turned up, folded back, and fastened down along the sides of the dorsal surface, somewhat as the edge of a piece of needlework is folded over to make a "hem." It is obvious, when one remembers the small size of the insect, that none of these peculiarities can be seen without the aid of a lens.

This little insect is an inhabitant of old wine-cellars,

where it feeds upon the fungoid incrustations on the walls, and, according to some, also attacks the corks of the bottles; some people, however, believe this last charge to be unsubstantiated, considering the real damage to have been done by other insects found in the cellars, in which case *Mycetæa* has got into evil repute through association with evil companions. Its larva is a whitish, fleshy grub, with six small legs in front.

In its cellar experiences, this insect is often accompanied by other minute beetles, especially certain tiny yellowish-brown ones of the genus *Cryptophagus*, a word derived from the Greek, and signifying an "eater in concealment." This is a large genus, and a very puzzling one, on account of the great similarity of the species. They may easily be distinguished from other small, similarly-coloured beetles by the fact that the lateral edges of the thorax are produced into tooth-like projections, which differ in shape and position in the different species, but are almost characteristic of the genus as a whole.

(*To be continued.*)

NERVOUS EXHAUSTION.

By EDWIN WOOTON.

(*Continued from p. 502.*)

TREATMENT.

THE producing causes must be found and abolished. If the nervousness result from the use of tea, coffee, or alcohol, substitute for these drinks cocoa, chocolate, milk, and at convenient times of the day oatmeal porridge. If the agent be tobacco, this must be abandoned. This altered dietary and method of living must be maintained until the patient has fully recovered his health, when, if he possess sufficient strength of mind not to abuse the articles mentioned, he may resume their use in a sparing manner.

But let him understand that at the first renewed symptom of nervous disorder, he should at once abandon that which, whether from his repeated folly of excessive indulgence in it, or from his peculiar susceptibility to its influence, is very evidently antagonistic to his constitution, and the name of the particular "that," his common sense should readily give.

The intoxicating drinks to be particularly avoided by nervous sufferers are those containing the largest percentage of alcohol; these are the spirits. While, on the other hand, the least injurious intoxicants are those whose alcoholic percentage is small—*i.e.*, stout and ale.

The active principle of malt is named Diastase. This will digest farinaceous food, and hence, as a medicinal agent in certain forms of indigestion, it is of value; besides which it is nutritious.

Under the name of Conroy's "Malt Coffee," there is manufactured and sold a mixture containing, as the name implies, both coffee and malt. Those who have taken coffee to excess and cannot make up their minds to totally relinquish its use, should drink the preparation I have named.

It very frequently happens that nervousness produced by the consumption of tobacco, arises not from the quantity but the quality of the article so consumed. That some tobaccos are mild and others strong is known to every one, but when smoking is condemned as hurtful to all persons practising it, few consider that the injurious effects of the practice depend on the quantity of the active principle in the tobacco, and that it is possible for one pipeful of the latter to contain more poison than six of another tobacco having a lesser strength. The same considerations apply to cigars.

The smoker, then, who finds himself unable, without enduring actual misery, to altogether give up his beloved habit, even for a few weeks, should reduce the amount of tobacco he consumes to the smallest allowance with which he can content himself, and it should be of the very mildest possible quality, and pure. Self deception will bring its own punishment; every man in such a case as I am considering is thrown back on his common sense, which dictates that he should do himself justice, and afford his body opportunity for the recovery of its health.

Cold bathing should be undergone daily before breakfast, and the body be afterwards rubbed till it glows. If the means are at hand, a shower-bath may be taken twice or three times weekly; and once a fortnight, until the recovery of health, the Turkish bath may be employed. These rules are not intended for the guidance of very debilitated persons. These need special treatment, and should seek personal advice. Exercise is of service, especially if taken early in the day. Sleep—that is, rest of brain—is essential. Every nervous patient should have at least seven hours—eight is a preferable number. During repose, repair in the nervous system is in excess of the waste—hence its value. With regard to the therapeutic treatment of nervousness, the subject is so essentially scientific that no patient whose ailment is in any way advanced would do well to attempt self-cure. In trifling or incipient cases, all that is required is an abandonment of the producing conditions, and, even when the disorder has made some progress, a general attention to dietetics—that is, proper food, drink, exercise, sleep, and bathing—will generally result in the re-establishment of health. But, these measures failing to remove the symptoms the sufferer knows so well, he should not attempt to be his own doctor, but take professional advice, which, while identical with the principles known to every neurologist, will be by the practitioner modified to the special case presented him.

If the sufferer cannot sleep at night, let him shun every preparation of opium, for the use of this drug will inevitably still further weaken the nerve centres. The head should rest on a high pillow, and the bed coverings be as light as possible. The only drug for procuring sleep the patient can with safety use is bromine. He may take it in the form of solution of bromide of iron, of which thirty drops in water immediately before retiring to rest will suffice. A still better preparation is the proprietary article, bromide of phosphorus. If sleep does not follow the use of these drugs, it will be better to seek advice suited to the particular case.

We have no more potent agent for the cure of nervous disorders than electricity. In the hands of a skilled medical man or physiologist, it proves itself to be, although not life, one of its physical factors. But, in the hands of an incompetent person it is *death;* and many have bitter cause to lament their rashly playing with, or having had played upon them, this terrible invisible agent.

Electricity, it may be explained, should, when used, be applied along the course of certain nerves, in certain directions, and at particular parts of the body's surface, and especially of the spine, where the seat of government of particular actions is situate. This being so, and the situation of these nerves and regions being known only to medical scientists, and, moreover, as no two nervous patients require *identical* treatment, it follows that self-application of the current by persons ignorant of the structure and functions of the body, and, more especially, of the laws of the nervous system, must result in mischief. Medical men, as a rule—I am speaking of neurologists—are not adverse to the

patient possessing and using a battery, if he will obey explicit directions as to the application of the current.

Lastly, one sentence to those who, in their wretchedness despair:—"Lift up your hearts." Science can help you, and if you but seek her aid will do so. She asks not faith, only obedience, for her teachings are the manifest truths of God's universe, and only fools disbelieve them.

DICKENS AND THACKERAY.

By RICHARD A. PROCTOR.

(*Continued from p.* 494.)

WHAT strikes me most in Thackeray's portraiture of women is that even those among his female characters who belong to the same category are so clearly discriminated. Amelia Selden is an amiable nonentity, and so is Rosey Mackenzie; but no one would ever mistake one for the other or either for Fanny Huxter. There is, in fact, no more resemblance between the two than there is between Rosey's fit of jealousy when Ethel Newcome brings the news of the letter found in Orme's History and Amelia's jealous love for that young pickle, her son. Again, Laura Pendennis and Charlotte Bayham are both amiable girls, both bright and intelligent, though neither is particularly clever; but they are no more to be mistaken for each other than Captain Costigan for General Bayham or for Colonel Newcome.

So with the unamiable ladies. Apart from the difference between the social condition of Becky Sharpe, Blanche Amory, and Fanny Mountain, they are perfectly distinct in character, though all are clever and unscrupulous, all seductive rather than attractive. Unlike these in nearly all respects, though belonging to the same category, is Beatrice Castlewood, just as Lady Castlewood is unlike all Thackeray's other amiable women (nearest, perhaps, to Helen Pendennis) and Clara Pulleyn unlike all those of the class to which she belongs.

The development of Mrs. Mackenzie's character from mere vulgarity to viragoism is worked out with surpassing skill. As other illustrations of Thackeray's skill in this direction I would mention the ladies of the Castlewood family and the two daughters of Sir Miles Carrington.

Thackeray seems to have taken keen delight in picturing good mothers. By the way, he was a great admirer of Steerforth's mother, in "David Copperfield," the only *lady* in Dickens' novels. A writer in the *Atlantic Monthly* a few years since said of Thackeray that he had given us scarcely any mother-characters; the *Atlantic* writer admitted, indeed, that Thackeray had given some good mothers, but, oddly enough, wrote as though two good mothers were neutralised by one bad one. I fancy I could name a score at least of mothers in Thackeray's novels without considering those in the "Snob Papers," "The Hoggarty Diamond," "The Bedford Row Conspiracy," "Our Street," &c., the wonderful mothers in "The Ravenswing," and "Barry Lyndon," or the sketches in "Denis Duval."

In "Vanity Fair" we have at least five mothers—Amelia Osborne, Mrs. Sedley, Lady Southdown, Mrs. Bute Crawley, and Mrs. Becky Crawley (*née* Sharpe) herself—to count only those who are depicted as mothers, good, bad, or indifferent. Mrs. Major O'Dowd views her military family in so motherly a way that she might almost be counted among Thackeray's mothers. In "Pendennis" we have four mothers—Helen Pendennis, the Begum, Harry Foker's "mum," and Fanny's foolish mother—not to count the mother of Mdlle. Caracole, or whatever the lady's name who adorned Foker's Richmond party. In "Esmond" there is only one "full-length" mother—Lady Castlewood, (a singularly skilful drawing, by the way, if the difficulty of the subject is considered); but in its sequel—"The Virginians"—there are at least six admirably-discriminated pictures of mothers—Rachel Warrington, Mrs. Mountain, Lady Castlewood the second,* Mrs. Lambert, Mrs. George Warrington (*née* Lambert), and Lady Warrington. In the "Newcomes" mothers are still more numerous. There are no less than eight—Lady Newcome, Mrs. Hobson Newcome, Leonore de Floraf, Laura Pendennis, Mrs. Mackenzie, Barnes Newcome's unhappy wife, Lady Walham and Lord Farintosh's mother (remarkable as having been resuscitated by Thackeray, who had killed her and forgotten all about it). In the "Adventures of Philip" (with the "Shabby Genteel Story") there are six mothers—Mrs. Gann, dear Caroline Brandon (Philip is as her own child we know), Mrs. Brandon Firmin, Mrs. Philip Firmin, Mrs. General Bayham and Philip's first threatened mother-in-law, Mrs. Twysden—all admirably sketched, though some with only a few masterly strokes. In "Lovel, the Widower," there are three mothers, all taking active parts in that wonderful scene which follows Lovel's declaration. In all no less than thirty-three admirably-delineated mothers (doubtless I have overlooked several) by the writer, of whom it has been absurdly said that he could never draw a woman.†

(*To be continued.*)

IRISH SEASIDE RESORTS

FROM AN UNCONVENTIONAL POINT OF VIEW.

By PERCY RUSSELL.

THE beauties of Ireland—chiefly, however, those inland—are usually associated in English minds with Samuel Lover and Thomas Moore, and in these days usually sadly

* By the way, has it been noticed that Maria Castlewood's age in the "Virginians" does not correspond with the record of her birth in "Esmond"?

† The writer in the *Atlantic Monthly* referred to above remarked also on the absence of "the mother" from fiction, where, if she is introduced at all, she is, he said, an uncomfortable figure, always in the way. But, with the exception of Dickens, who certainly (for reasons too easily to be guessed) has few mothers, and those mostly unpleasant ones, in his novels, the *Atlantic* writer was rather unfortunate in his selections. He says there were no mothers in "Sandford and Merton," in "Jane Eyre," in the "Wide, Wide World," or in "Guy Livingstone." Can he have forgotten Tommy Merton's foolish mother, or the poor woman for whom that weak but kindly boy (whom most of us used to like much better though than the goody-goody bore, Harry Sandford) begged £40 from his father? Besides, is not Sandford's mother introduced to us at the end of the story, when Mr. Merton visits Farmer Sandford? In the "Wide, Wide World" there is one of the sweetest mothers of fiction—Mrs. Montgomery—and Nancy Vawse's grandmother ought to count as a mother. So in "Jane Eyre" there is, at the beginning of the story, a mother, and a well-drawn one, though she is not a pleasing picture, and we are introduced to two further on. Guy Livingstone's mother is one of the most striking characters in that most repulsive story. The *Atlantic* writer goes on to mention that Charles Reade has mothers—Catherine, in "The Cloister and the Hearth," for instance, and the Baroness, in "White Lies;" "but there are three fathers and no mothers in 'Foul Play;' 'Griffith Gaunt' has two wives at once, but no mother," and so forth. If he had named Lucy Dodd, however, he would have indicated as much motherhood in Reade's writings as would compensate for a dozen motherless novels. Though, by the way, there are two mothers, as well as two wives, in "Griffith Gaunt" (to say nothing of Mrs. Vint), and in the prison scene between Mercy Vint and Mrs. Gaunt the mother feeling in woman is drawn with singular force. (I think it will be found that of all novelists who have written much Cooper has about the smallest proportion of the maternal element.)

discounted by our comparatively unsentimental "Saxon" who has not seen them. As to the coast, except in a few instances, the mass of Englishmen know but little about it; yet, in some respects, it equals, if it does not exceed for sublimity anything to be found in Great Britain, and includes so many comparatively unknown, because unfrequented, stretches of most picturesque shore that to many who have "done" some of the more celebrated regions of the globe, a well-planned coasting expedition around Ireland would be in many respects a very welcome revelation of much that is most pleasing, new, and strange.

Ireland—the extremity of Europe—is swept on the west by an ocean that extends in unbroken expanse for full nine thousand miles. The geological formation of this island—which has, as geology necessarily does, exercised an enormous influence on Irish history—is altogether peculiar and unparalleled in the British Isles. Within four great headlands—Fair Head, north-east; Erris Head, north-west; Mizen Head, south-west; and Carnsore Head, south-east, is a vast plain, having but a few hills, soaring up everywhere towards the sea-coast into mountains which give the shores, especially on the south-west and north, a singular grandeur and a wild, rugged, often fantastic, beauty peculiar to itself. It has been aptly said that were Ireland to sink down a little—not an impossible thing by any means—the interior would then form an enormous inland sea, having an internal archipelago and a stern granite mountainous wall, but little broken, to oppose all round to the ocean. The principal interruptions, indeed, to the external mountain rim—if I may so call it—which encloses Ireland are caused by Dublin and Galway Bays respectively. The northern highlands, including the Antrim Mountains, attain an elevation of about 2,000 ft., and the culminating point, Mount Errigal, is 2,462 ft. high. The ranges form in many cases table-lands, and these end with terrible abruptness, and impart to the coasts a most precipitous character.

In the west the Nephin Beg Mountains are higher and more savage than those of Donegal, and Nephin, the principal summit, attains a height of 2,646 ft., ending in the grand cliffs of Achill Island, ranging from 900 to nearly 2,000 ft. high. Achill, or rather Eagle, Island is off the west coast of Mayo, and is about 15 miles by 12, possessing a most irregular and picturesque landscape, after the Salvator Rosa type. It is reckoned to include an area of 35,000 acres, of which certainly not a thousand are cultivated. Here may be seen a very singular mountain composed entirely of mica slate, rising out of the Atlantic a sheer precipice 2,208 ft. high.

The southern peninsula includes the Connemara Mountains, which culminate on or very near the coast, and occasionally soar up in grand isolated masses of granite, and in other cases are found in groups.

Passing south there are the mountains of Kerry, with Macgillicuddy's Reeks, the highest mountains in Ireland (3,400 ft.), and proceeding eastwards are the Wicklow Mountains, with Lug-na-quilla (over 3,000 ft.), and the Mourne Mountains.

Broadly speaking, Ireland consists of a great central plain of limestone rock, once covered with dense forests, and generally having a natural mountainous wall on the coasts, which gain thence a marked grandeur and general picturesqueness. So extensive and numerous are the sinuosities of the shores of Ireland, that the total length of the coast-line, if extended, would reach 2,000 miles! No part of Ireland can be over 50 miles from sea or a good navigable river, and yet we know too well in how low a condition are the principal industries of the island.

The north and west shores are, like West Scotland, studded with numerous isles, but these are mostly very small; many, indeed, are mere rocks, and incapable of sheltering even one inhabitant properly; but they add, all the same, great variety, and, from an artistic view-point, much wild beauty, to the general seascape of the west. As for the shores themselves, these may be described as shielded by tremendous cliffs against the terrific storms of the Atlantic, and generally the coast is broken by a number of small rivers which flow directly down a short course from the highlands of their origin. The north coast is remarkable for Rathlin Island, composed entirely of basalt with limestone, and for the Giants' Causeway.

Dublin County has a coast-line of about 70 miles, off which lie several islands. The Bay of Dublin (Dubh-linn, *i.e.*, black pool) is guarded on each side by precipitous hills full 500 ft. high, and having the curious eminence of Lambay Isle, or Ireland's Eye. All along the coast are good fishing-grounds for turbot, brill, sole, plaice, cod, haddock, and last, but to many by no means least, oysters. Proceeding north, Louth is the next maritime county with its fine heights, that, under the name of Carlingford Mountain, nearly 2,000 ft. high, overlook the bay of that name. These heights are chiefly granite with limestone and clay slate. This county—the smallest in Ireland—is eminently remarkable for its ecclesiastical antiquities, its round towers, and its Celtic remains generally.

Continuing our survey of the maritime counties, next comes Down, having an interesting coast-line of 67 miles, or, reckoning the islands off it, 125. Here are the Mourne Mountains, covering 90 square miles, and culminating in Slieve Donagh, 2,796 ft. Silurian and granite rocks constitute the greater part of the country; and, on the top of Slieve Croob (1,755 ft. high) may be seen over twenty cairns, one being of the remarkable height of 50 ft. Antrim, third among Irish counties in population, and only ninth in extent, has a sea-coast of 90 miles, and includes that extraordinary natural feature of the island, the Giants' Causeway. The surface of Antrim consists chiefly of basaltic trap, sometimes alternating with red ochre, and overlying hard chalk, greensand, mica slate, millstone grit, and, in the Giants' Causeway, the most perfect specimens of columnar basalt in the world. Londonderry has comparatively a short coast line; but it is bold and frequently precipitous, and the River Bann, separating it from Antrim, is famous for its salmon. Donegal, with its coast line of 395 miles, deeply indented by bays and loughs, some over 25 miles long, its numerous islands, tremendous mountains, lakes, and rivers steeped in the accumulated fairy lore and the romantic traditions of a very superstitious, uncultured, but highly imaginative people, is, indeed, deeply interesting ground. The geological structure of Donegal is granite, metamorphic rock, graywacke, Devonian limestone, and marble. The climate is wild, too, and boisterous, especially during the prevalence of western gales; and, near the coast, it is not uncommon to meet with the ruins of habitations that have been completely wrecked by terrific storms of sand. Donegal is rich in archæological remains, abounds in the ruins of rude old fortresses, and boasts the site and remains of the palace of the old North Irish kings, and of the famous Coronation Stone of the old monarchs of Erin. Many interesting memorials are here to be found of St. Columba; and on an isle in Loch Derg is a place, interesting to antiquarians, known as St. Patrick's Purgatory. Close to one of the headlands is a singular cavern, having an opening in the roof, whence at seasons rudimous jets of water are shot forth like the explosion of a cannon.

(To be continued.)

WATCH-MAKING AT THE INVENTIONS EXHIBITION.

(*Continued from p. 500.*)

IN the Escapement Department (Fig. 6) are made several of the pieces (thirteen in all) involved in the escapement, including the roller and roller jewel, the pallet and its two jewels, escape-wheel, &c. The garnet pallet stones are placed thirty or forty together, on a steel block ground, and finished on one side and then on the other. The edges are finished the same way. They are then stacked on a graduated plate, and marked with a diamond to be broken off to a length. They are then put in a grooved pallet set at the desired angle for the impulse force. All are finished with diamond dust on ivory laps. The polishing is done with an oscillatory motion.

The escape-wheel cutting, which may be examined at the Exhibition, is done by an automatic machine, provided with two steel and four sapphire cutters. Fifty wheels are cut together, and for that purpose they are threaded on to a spindle.

The movements of the machine are exceedingly ingenious. The cutters make 8,500 revolutions per minute, and notwithstanding this enormous speed, the bearings are so well made and looked after as never to become heated.

One of the cutters, revolving at this speed, approaches the wheels, and, passing longitudinally over them, makes a first cut. The spindle then automatically moves one step round, the distance equalling that between two teeth, and the cutter makes its way through the wheels again; this operation being repeated for the whole of the fifteen teeth, when the second cutter is automatically thrown into gear, and enlarges each of the cuts made in each of the wheels by the first cutter. So on with the third, fourth, fifth, and sixth cutters; and, when the last cutter has made its last and finishing cut, the machine stops—automatically, of course. The wheels are unthreaded, and a fresh batch takes their place.

In the balance-making room, Fig. 7, a large number of operations are carried on. The balance compensation is effected with exquisite delicacy and rapidity, and the operation is most interesting. A disc is punched out of a steel plate, centred, drilled, and turned to a fine measure. A cup of pure copper somewhat larger is struck, and a ring of bronze made, which, when the steel disc is placed in the cup, shall just fill the interspace. The whole is placed in the furnace and the ring is fused on the disc without solder, the disc put in the lathe, and turned down to the outer diameter of the balance-wheel, faced on both sides, and drops out at a tiny circular plate of steel, framed in bronze. It then goes into a lathe, where the steel is cut away, so as to leave a shallow cup with a delicate wall of the compensating combination. This goes into a die, and two crescents are punched out of the plate, leaving the cross-bar on which the wheel swings. It then goes into a machine which removes the burr left by the die, and then into a lathe which rotates it, while a tool drills, and another taps, by a gauge, sixteen holes round its circumference, and a girl inserts the regulating screws. After this, the hair-spring is fitted. The average weight of a balance-wheel is 8 grains.

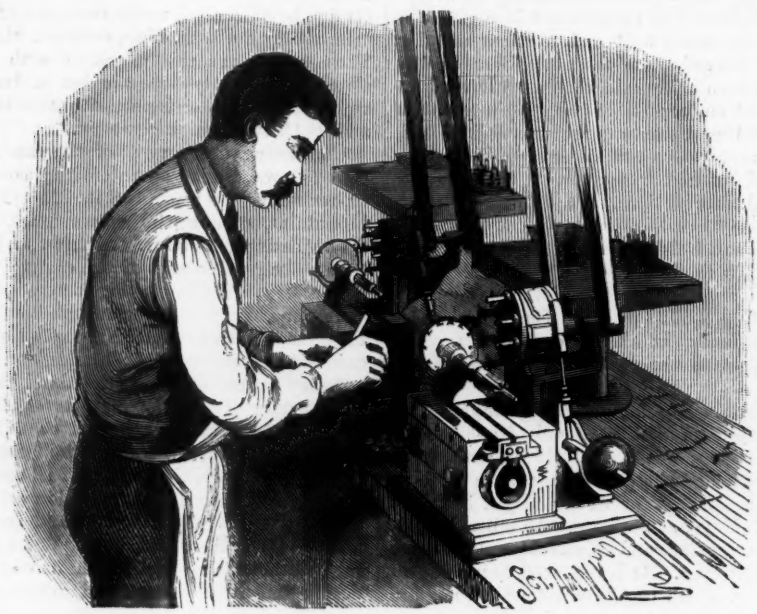


Fig. 6.

The hair-spring is considered of sufficient importance to have a department to itself. The springs are rolled from fine steel-wire ·022 of a centimètre in diameter, and drawn between four diamonds, two for the faces and two for the edges. The ultimate dimensions of the steel are ·027 of a centimètre wide and ·008 thick; fourteen lengths of inches are then cut off, coiled up, placed in boxes, and then hardened and tempered, after which they are cleaned by immersion in acid, and blued. It is said that a pound of the fine steel-wire employed for hair-springs costs at the outside twenty shillings, and cuts into 17,280 springs, the lowest value of which is computed at £1,400. The gauging of the springs (Fig. 8) is a pretty process, which may be seen in operation at the Exhibition. The gauge consists of a dial-plate 7 in. in diameter and divided round its circumference into 2,000 divisions. Under this plate is another

somewhat larger, which is fixed when the machine is in use, but which at other times will revolve. Encircling the dial-plate and resting on the lower plate is a metal ring carrying an arm provided with a small horizontal plunger. The spring to be gauged is provided with a small collet which slips over a staff (attached to which is a spring of known strength) on the centre of the dial plate, and is there held by friction. The horizontal plunger above-mentioned holds the stud attached to the other end of the spring against the arm. The ring (and with it the arm) are carried through a complete revolution, and an index, which moves over the dial-plate with the inner end of the spring, indicates the spring's strength in one direction, say in coiling up. The ring and arm are carried back again through a revolution, so that the index returns to zero, when the ring is made to perform a revolution in the opposite direction to that first taken, so as to test the strength of the spring in uncoiling. It is found that the strength in both directions is almost identical. Thus one we saw, being gauged, carried the arm through 1,380 divisions each way, another through 1,432 one way and 1,433 the other way. In the event of the strengths varying, the mean of the two readings is taken. A table is provided as the outcome of long experiment, by which it may be found at a glance what the weight of the balance must be for a spring of any given strength. Thus that spring which recorded 1,380 would be fitted to a balance weighing 9·44 grains. A vibrating machine is used for timing the springs. A standard spring and balance are suspended from an arm, and from another arm is suspended the spring to be tested. The two arms are geared together and moved through a portion of a revolution and back again, whereby the springs and balances are set vibrating. It requires but little experience to determine whether or not they vibrate synchronously.

Fig. 7.

Fig. 8.

NOBERT'S RULING MACHINE.

BY JOHN MAYALL, JUN., F.R.M.S., F.Z.S.

(*Continued from p. 504.*)

FOR the production of diffraction gratings, interference-plates, and micrometers, where the equi-distance of the lines would be of extreme importance, and where the breadth of space covered by the lines is so large that the lever motion in arc would have produced errors in the evenness of the division, Herr Nobert removed the bent arm from the centre of the division-plate, and substituted a vertical cylinder, on which he coiled an extremely thin, flat steel spring, having a hook at the free end. This hook he attached to a stud beneath the polished steel cylinder which carries the glass plate to be ruled under the diamond, and which takes the place of the carrier used for the test-plates. The rotation of the division-plate caused the vertical cylinder in the centre to rotate, coiling the steel spring, and thus, after the manner of a windlass, hauled along the diffraction-plate carrier at right angles to the ruling motion of the diamond.

In a former description of this part of the machine (given at the Royal Microscopical Society) I stated that Nobert probably used the stud and "dots" to divide his diffraction gratings, &c. On further consideration, I find I was in error on this point. Incredible as it may seem, I am now convinced he must have used the micrometer-

microscope on the division-plate for every line, although, as a matter of fact, some of his diffraction gratings had 12,000 lines upon them. Where such extreme accuracy was needed, he would assuredly adopt the most certain method, which is to work with the division-plate and the micrometer-microscope. Here, indeed, is an example of perseverance. Imagine the task of adjusting the divisions under the micrometer-microscope, winding-up the train of wheels, lowering the diamond on the plate, starting the train, watching for a possible vibration in the mercury bath during the actual ruling, which might ruin the scientific value of the plate, then lifting the diamond by the eccentric roller preparatory to recommencing the whole operation—12,000 times in succession!

The preparation of the diamond points has long been considered as the grand secret of Nobert's success. Beyond the admission of the bare fact that he did use diamonds, he kept the secret of their preparation. When the machine came into my hands I expected to be able to explain the preparation of the ruling points immediately by inspection with the microscope; but the matter was far more difficult than I had supposed. My appeal to diamond "experts" brought me face to face with absolute contradictions. There were ten diamonds with the machine. Two of them were technically termed "points," pyramidal fragments of diamond terminating in points. All were agreed that these were untouched by the polishing mill. The other eight diamonds each presented the general form of two faces meeting in an "edge"; the difficulty was to decide whether the faces were in some cases (1) both polished, (2) both cleaved (cleavage-faces unpolished), or (3) one polished and one cleaved. The opinions of the diamond experts could not be reconciled, for in two instances they were wholly opposed, one party affirming that both faces were polished, whilst the other party were equally positive that both faces were due to cleavage alone, and were not polished. Under these circumstances, it appeared to me essential to submit the diamonds to a test of the goniometer, with a view to determining whether the angles of the natural cleavage-planes had been altered, any such alteration being necessarily due to artificial polishing of one or both faces. I thought it would be most satisfactory to ask the assistance of a professional mineralogist, and, therefore, applied to Mr. Lazarus Fletcher, of the Mineralogical Department in the British Museum, who very kindly undertook to examine the diamonds, and measure the angles with Fuess's goniometer. In Mr. Fletcher's opinion the two "points" were untouched by the polishing mill; diamond No. 4 consisted of two cleavage-faces meeting in the edge, and was untouched by the mill; in each of the seven remaining cases, one of the faces meeting in the edge was an untouched cleavage-face, and the other had been polished, and in some cases an additional fact or two developed on that side. The goniometer showed that in the polishing the angles had been altered from the natural cleavage-planes by quantities varying from a few minutes up to about six degrees, and as no two were exactly alike, it might be assumed that, as Mr. Fletcher suggested, "the alteration of the angle is merely an incident of the polishing," and not a condition distinctly aimed at by Herr Nobert. I had previously stated (at the Royal Microscopical Society) that some of the diamonds appeared to have two polished faces meeting in an edge. On closer examination in Mr. Fletcher's presence, I found that certain striations on the faces, which I had regarded as imperfectly polished, were more probably untouched, and hence I have given my adhesion unreservedly to his judgment.

As to the mode of preparing the ruling diamonds adopted by Herr Nobert, I have no record, save the diamonds themselves; the matter can only be decided by conjecture. After various consultations with diamond experts, I have come to the conclusion that diamonds exhibiting under the microscope precisely the character of the seven "edges" to which I have referred, could be prepared from the fragments of gem diamonds met with at any diamond cleaver's. The cleaver would select a fragment which would admit of two faces being cleaved to an edge of about 1-16th or 1-20th inch in length; one of these faces should be perfectly polished on the mill, as nearly as might be parallel with the cleavage face; the other face should then be cleaved again parallel to its former cleavage, so as to remove the edge, which would probably have been somewhat rounded by the mill, thus furnishing a new and probably sharper edge—a clean fractured face meeting the plane polished face. The diamond should then be mounted in soft metal, in a notch at the end of a piece of brass wire, by means of the blowpipe.

Nobert's original rulings appear to have been made on artificially-polished surfaces. Later on, he experimented with thin cover-glass, ruling on the natural or melted surface. More recently, Dr. Schröder called his attention to a kind of glass technically termed "mild" glass, and instructed him in a method of polishing, which induced him to revert to artificial surfaces again. The plates ruled since 1869 are probably all of "mild" glass, thinned down to suit high powers. In 1869 he adopted a plan suggested by Dr. Woodward—namely, to rule on thin glass, and mount the ruled plate on another thin glass, the whole dropping into a countersunk opening in a brass plate three by one inch, on which the data of the rulings were engraved, Dr. Woodward suggested this plan in order to facilitate the employment of an achromatic condenser of large aperture and short focus.

The memorandum-book shows that in ruling a 30-band plate, Nobert commenced with the coarser lines, using a weight-pressure of 30 grammes on the diamond, which was gradually diminished until for the highest band he used only 3 grammes. A later entry seems to imply that he reversed the order of the ruling, commencing with the finest lines and lightest pressure.

I do not, as yet, know what means he adopted (if any) to secure his rulings from the effects of changes of temperature on the division-plate, &c., during the process of ruling. It is said that he removed from Greifswald to Barth, because in the former town he found the vibration detrimental; also that his finest work was done always during the night; on these matters I have no positive information at present.

In conclusion, I may express my conviction that the publication of the data obtained from the examination of the machine, and especially of the diamonds, will further the interests of micrometry. Several ruling-machines exist in Europe and America capable of dividing space as minutely and accurately as Nobert's machine; but most, if not all, of them refuse to rule lines at all comparable to his when the closeness exceeds about 50,000 to the inch; and this is, I believe, mainly if not wholly, due to imperfection in the diamond, or in the method of regulating its pressure on the surface to be ruled.

I venture to predict that when the history of the mechanical inventions of our time comes to be written, a large measure of credit will be assigned to the mechanical genius of Herr Nobert, as embodied in this ruling-machine.

THE errors of the Westminster clock during 1884 were under 1 sec. on 50 per cent. of the days of observation, between 1 and 2 secs. on 29 per cent., between 2 and 3 secs. on 10 per cent., between 3 and 4 secs. on 7 per cent., and over 4 sec. on 4 per cent.

ON CERTAIN CORRUPTIONS OF ENGLISH.

BY "HALLYARDS."

I. "THAN WHOM."

PROBABLY no one ever wrote "than who." Why? "Than" is a conjunction, and the rule is that conjunctions join like cases. If, therefore, a nominative precedes "than," a nominative should follow it, and "whom" is an accusative.

In Latin and Greek comparison is made either by the conjunction, as in modern tongues, or by an oblique case, ablative (L), or genitive (G). But in the case of the relative pronoun the method with the conjunction alone can be used; and it is probably this which has led us into a muddle. In French, &c., the expression "than whom" cannot occur; no clause could begin "que que," or "que qui"; no more than in Latin, where we can say "quem quam," but not "quam quem"; or, to put it "putide," we may say "quem quam" in two senses, but not in a third—a comparative sense.

In the earlier standards of style "than" is not made to govern an accusative. But for nearly two centuries (1650–1850) "than" and "as" were treated as prepositions. For the former examples can be found in Swift, Bolingbroke, Atterbury, and Prior; for the latter in Hobbes, Alison, and Trench.

If I held a brief for "than whom," I would urge that there is something to be said for it; as thus, when we say "quo nil est majus," the oblique case contains in itself the idea of a preposition, since all oblique cases are originally formed by tacking a preposition on to the word. Then, as we can translate "quo" only by "than," the latter takes the guise of a preposition; and prepositions in English govern the accusative, hence "than whom," &c. But if this pleading prevail, then "than" must be reckoned as a preposition, or a preposition as well as a conjunction, or as a preposition-conjunction. If not, the only logical thing to do is to proscribe "than whom" altogether, and rigidly to write "than who," whenever we feel bound to begin our phrase with those words.

If it were not by the sense of the latent preposition in "quo," &c., that "than whom," &c., established themselves, it was probably from their use in cases where the accusative would be correct; *e.g.*, "than whom I honour none more." To account for the use of "as" governing the accusative, I can only suggest that the comparison of inequality attracted that of equality into its own predicament, like so many usages of attraction in Greek, which seem flagrant violations of common sense at first sight, and from which Latin is absolutely free.

II. "HAVE . . . . TO HAVE . . . ."

"Sir, Mr. C. called." "Ah, I should have liked 'to have' seen him." This odious nonsense is now the very flower and essence of superior style. (No doubt it can be backed by examples in classical English; but so can any monstrosity. Even in Shakespeare we find "Return it back." And the Greek classics are full of similar laches, as the Latin are of ridiculous bad Latin—*i.e.*, "Græcisms," even as the Gallicisms now creeping like microzymes of evil portent across the "silver streak," which we still fondly call the English Channel. "Have you ever been across the 'American Channel,' Sir?" I heard a woman say to the steward on board a night-boat from Folkestone. This struck me as a neat alias for the Atlantic.) "I should have liked to 'have seen him," should be, "I should have liked (had I been in) 'to see him' ('then')." "I should have liked to have seen him" is also a perfectly correct phrase, but in another sense—*i.e.*, "to have seen him ('previously')." "J'aurais desiré l'avoir vu." "Voluissem cum 'vidissi.'" These blunders would call down severe animadversion from any teacher of Latin or French; why should illogical French or Latin be logical English? The coupling of these two "haves" always sounds to my ear like the step made by a hobbled beast when he has browzed all within reach of his mouth.

III.—POSSESSIVE PRONOUNS PRECEDING THEIR NOUNS.

A pestilent practice, growing more and more common both in English and French, giving always a feeling like a bad smell, and not unfrequently bewildering the sense. I take one recent example from the *Saturday Review* on the Laureate's "Becket":—"The King and Becket are discovered playing a game at chess, and the future is somewhat obviously foreshadowed by the conquest [this, too, is incorrect; he means victory] of Becket, who mates the King with his Bishop. Although he has been so engaged with his thoughts as to take no interest in the game——." Now, "who" had been, &c.? By all laws of grammar and common sense, the pronoun "he" should refer to the noun and pronouns immediately preceding, "Becket," and "who," and "his." So I thought in reading. But not so at all; it goes on:—"'Henry' somewhat inconsistently," &c.

In this instance it is a personal pronoun that is put *before the noun*, whose "pro" it is, or through, we should say, "the pro-proctors *and* proctors"; but the more usual offence is to write a possessive one, and then its personal, or its noun, afterwards. This is done, it would seem, chiefly in order to avoid the trouble of constructing a lucid, logical sentence. It is never in any way necessary.

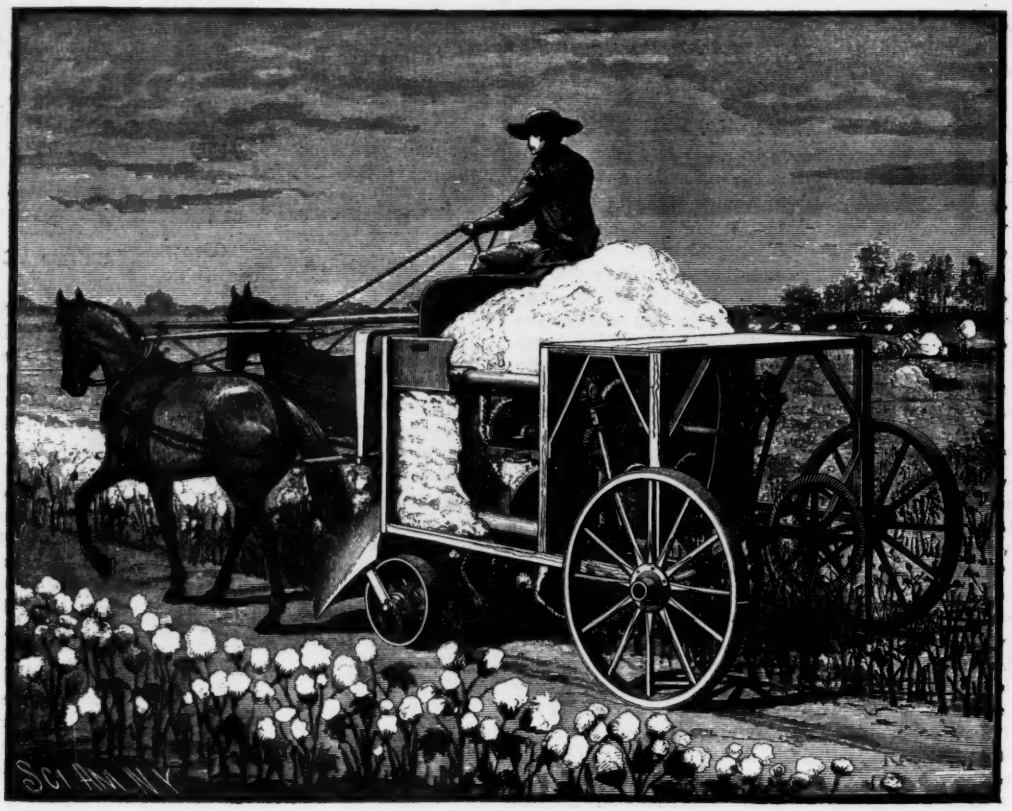
Certainly, in Latin and Greek it is sometimes a great elegance to put the possessive first, or in such a phrase as "Suâ enim mole suit tyrannis," where the pronoun is rightly foremost, in order to mark as prominently as possible the sense of *our*. But each language has its own proper order of words, and we cannot borrow at will from the foreigner in this respect.

IV.—"I NEVER REMEMBER TO HAVE SEEN."

This phrase is used by the best writers. Should it not be, "I do not remember ever to have seen?" A comparison will help. "Je ne me rappelle jamais d'avoir vu" is the French equivalent of the form I object to. It states a fact, but not the fact required, which is "Je ne me rappelle d'avoir jamais vu." I suppose, indeed, that all who use the "I never," &c., would agree on a moment's thought that it is incorrect; but it is astonishing how very general it is, in spite of that.

V.—"A CERTAIN ———."

Scores of English writers now say, *e.g.*, "a certain dignity," meaning "une certaine dignité," which means not "such a dignity as may be named—some honour or preferment"—but "a certain amount of dignity in the behaviour." The purer English would be "some amount or degree of dignity." The phrase is very illogical, either in French or English; for it is always used precisely where the quantity is uncertain; much or "a certain age" said of a lady, which may mean any age from thirty to fifty. Certainly, we all translate "τίς" and "quidam" a "certain one," "a certain person." But that means "one whom I, the speaker, know, or choose to pretend I know." Then



An Automatic Cotton-Picker.

from it came to be used for "any one at all," which is not "quidam," but "quicunque." It is surely a vice of language to be resisted that a word meaning often and properly "fixed, sure," should also mean "not sure," "uncertain," and even "a little," which is almost as wide of its origin.

Many a foreign object of questionable advantage has fallen into our "well of English undefiled" since Johnson so qualified the tongue of Chaucer; but the above are not mere French chalk, or Spanish white, or Italian irons, or Russia leather—which may lie or float without harm—they are noxious matter, which will alter the very character of the water itself; and that man would deserve a statue who should succeed in stamping them out, as the source of a true "mouth-disease" among our homoglosses.

AN AUTOMATIC COTTON-PICKER.

COTTON-PICKING is now almost universally done by hand, and, as a matter of course, is a slow, tedious, and expensive operation. A machine which would successfully take the place of hand-picking has long been needed, but there have been, so far, too many difficulties lying in the way of its construction and perfect operation. The work required of it is of such a delicate and exacting nature as to require a most accurate piece of mechanism. The perfect machine should remove all the fibre from every pod, should leave the plants uninjured, should require a minimum amount of care and attendance, and should be rapid in operation.

The cotton-harvester here illustrated is mounted upon wheels which stride the cotton row, and is designed to gather the cotton from the growing plants with the least possible damage to them, and to automatically deliver the cotton into a receptacle carried on the machine.

The machine is double, there being a right and left portion, each forming a complete self-operating machine, and the two being connected together by the top-yoke portion of the frame, so as to run astride the row, each part of the machine reaching in among the branches on its side of the row to pick the seed-cotton. This is accomplished by a series of gibbous-shaped plates mounted on a pair of longitudinal shafts journaled in the frame and revolved by the main driving-wheels acting through suitable beveled gears; the picker-shafts make about five revolutions to one revolution of the driving-wheels. The plates are bounded by two convex arcs of a circle, and are rounded at the ends to enable them to part their way among the cotton-branches while revolving, and to permit them to crowd up out of their path any limbs which may chance to lie across the apertures in which they rotate. Each of the plates is perforated near one edge to receive the shaft upon which they are fixed to project alternately on opposite sides to balance each other; their motion is across the path of the machine and upward through the cotton. The front face of each plate is armed with a great many picking-teeth set like card-teeth to hook in the direction of their motion to pick the cotton. By the revolution of the plates or pickers the cotton is carried through the apertures in the wall of the brush-box, and is there stripped from the pickers by rapidly-revolving vertical brushes. The

cotton thus accumulates in the brush-box against the foot of a revolving toothed-apron, by which it is carried up and thrown into a removable receptacle, where it remains until unloaded by hand. The brushes and apron are revolved by suitable trains of gears connected with the main driving-wheels.

The forward end of the machine is supported upon two caster-wheels, in front of which are placed sheet-iron guards to turn the limbs of the plants out of their paths, the guards converging towards the passage between the two portions of the machine to bring the cotton to the pickers. When the machine is provided with more than one pair of pickers, the second pair is placed above the first, so as to adapt the machine to cotton of any height; the plates of the lower pair are intended to approach within about four inches of each other. The plates of the upper pair are intended to touch a central vertical plane, in order that they may reach entirely across through the row of plants. The picker-plates of the upper pair in each instance pass between the plates of the next lower pair, to a distance of about four inches, to prevent the branches being drawn in among them.

The tongue of the machine is attached to the frame at the centre of the forward cross-bar, and extends forward over the tops of the plants, and carries a yoke above the necks of the team. The traces are secured to single trees attached to a double tree pivoted to the frame, and which bends down to the proper level for attaching the team. The receptacle is made of wire cloth supported on a frame, to allow sand and dirt to be jarred out of the picked cotton.

The principal point in this machine consists in the use of the gibbous plates, the teeth of which being thickly set —card-like—on the front side at an angle of 30°, and protected on the outer edge by a rim exactly abutting with the plane of the teeth, which are perfectly true, prevents the possibility of the teeth taking anything but lint. A leaf, or limb, or even the hand, will pass freely over the surface of the teeth. The two tiers of plates extend up about five feet, and if desirable to reach higher, other tiers can be added. As the machine passes over the row, the picker-plates come in contact with every one half-inch of the entire plants from top to bottom, and gather every boll of open cotton, which is delivered to the receptacle absolutely free from dirt of every description. The capacity of the machine is measured by the number of acres it can be drawn over in a given time, and the amount of open cotton it encounters. For instance, if there were half a bale to the acre, and it were drawn over eight acres a day, this would not be an excessive load for two horses. The machine weighs about 800lb., and would pick out four bales per day, thus doing the work of sixty hands. At this rate this machine could gather cotton at a cost of less than 1 dol. per bale.

The machine is simple in construction, the parts are few, and not liable to derangement, and it removes the cotton, whether from high or low plants, efficiently and rapidly, and leaves the plants in as uninjured a condition as possible.—*Scientific American.*

AN "AMMONIAPHONE" CONCERT. — That Dr. Carter Moffat's Ammoniaphone ranks high in public favour was amply evidenced by the presence of a distinguished company, which assembled in St. James's Hall, on Friday evening last, in response to invitations issued by Mr. C. B. Harness, of the Medical Battery Company, the proprietors of Dr. Moffat's invention, who signalised the opening of the Company's new and spacious premises, 52, Oxford-street, W., by giving his second "Ammoniaphone" invitation concert. All the artistes testified, by volunteering their services, their appreciation of the benefits they have derived from Dr. Moffat's remarkable invention.

Editorial Gossip.

NOTE FROM MR. PROCTOR.

I HAVE much pleasure in announcing that I hope to return to England—after an unexpectedly long absence—in July. On or soon after my return, series of papers on the following subjects will be commenced or continued :—Descriptive astronomy; double stars and other telescopic objects; light-sifting; and mapping. Seaside readings are also in preparation; and the Whist Column, which has been intermittent during my absence, will appear weekly. Several other additions or improvements are in contemplation. Only those articles will be discontinued which have not seemed to me altogether consistent with the original plan and purpose of KNOWLEDGE.—RICHARD A. PROCTOR.

THE fire at the Indian Museum at South Kensington, which was within an ace of involving the Inventions Exhibition itself, had its origin apparently in the flue of a cooking-stove. "These things are an allegory." The fact is, that a prominence has been given to mere eating and drinking at the shows there during the last two or three years which is enough to disgust any one and every one who has gone thither with the mere view of instruction. It is simply impossible to attempt a short cut from one court to another without tumbling over a lot of people sitting at little tables eating cold meat and salad and drinking Guinness's stout or coffee, and the like. Let it not be supposed that I am so foolish as to imagine that people can drag all the way to Brompton and spend a weary and fatiguing day in wandering through the buildings there without requiring anything to eat or drink. What I protest against is the prominence given to eating and drinking, and its obtrusiveness all over the place. Presumably, though, the Royal, noble, and right honourable showmen find that it pays to turn the Exhibition into a kind of glorified tavern or tea-garden, or they would cease to do so.

THE irony of fate has seldom been more conspicuously exhibited than it was on Tuesday week, in the presence of the Archbishop of Canterbury, at the ceremony of unveiling the statue of one of the greatest, if not the very greatest, naturalists the world has ever seen. Men who have not yet arrived at middle age can recollect how Charles Darwin's first immortal works were shrieked at and denounced as atheistical and worse, from almost every pulpit in the Kingdom; from that of the Cathedral down to the rostrum of the veriest little Bethel; and how the highest dignitaries of the Church united with Messrs. Chadband & Co. in their frantic howls at a theory now held by practically every competent living naturalist. How forcibly this recalls the whilom dictum of Sir Charles Lyell. "Every scientific truth passes through three stages. In the first it is decried as absurd. Then it is said to be opposed to revealed religion. Finally, everybody knew it before." That Darwin should have a statue is perhaps right at a time when so many dummies and non-entities have their memories perpetuated in bronze and marble that it might have seemed almost an intentional slight had he been denied one. He will, however, live in the results of his imperishable discoveries and investigations when time shall even have left its trace on the very material of his monument itself, for surely no one in this generation could with greater truth have adopted for his own the familiar words of Ovid—"*Jamque opus exegi, quod nec Jovis ira, nec ignis, nec poterit ferrum, nec edax*

abolere vetustas"—than the great departed philosopher to whom this poor homage was rendered.

"IT would seem," says the Astronomer Royal in his report to the Board of Visitors of the Royal Observatory, on June 6 (page 10), "that the maximum both of sun-spots and faculæ occurred about the end of 1883 or beginning of 1884." And again (p. 14), "the rainfall of 1884 was 18·0 inches, being about 7 inches below the average of the last forty years." I would commend the study of these utterances of Mr. Christie to the lecturer who not very long since presumed upon the ignorance of a working-class audience at the Victoria Hall, by repeating, parrot-like, the dictum of a notorious member of the Solar Physics Committee there.

AMONG the *vexatæ quæstiones* of geology, the precise manner in which coal was formed has always held a prominent place. The last light which has been shed upon this much-disputed question comes to us from the researches of Mr. Edward Wethered, who, from an elaborate series of microscopical observations of coal from Cannock Chase, the Edinburgh Whitehill Colliery, &c., has arrived at the conclusion that the fossil trees so familiar to botanists grew *in* the coal, but did not form it, and that it really "was of aquatic habit, growing in a manner similar to modern bogs, though of much larger extent." Every one interested in the subject should consult Mr. Wethered's paper itself in the June number of the "Journal of the Royal Microscopical Society."

I AM almost afraid to advert here to the fact that on this day 670 years—in other words, on June 19th, 1215—Magna Charta was signed, lest some silly country clergyman should write next week and assail me for covertly attacking the divine right of kings by doing so. One of these odd days, I will be even with these gentry, and retaliate by printing a specimen of their preposterous communications *in extenso*.

Reviews.

SOME BOOKS ON OUR TABLE.

A Lump of Gold, from the Mine to the Mint. By ALEXANDER WATT. (London: A. Johnston. 1885.)—The work whose title heads this notice forms one of the companion volumes to the "Lumps of Iron" by the same author, which we reviewed on p. 370 of Volume V. Commencing with a short history of gold, from its first-recorded occurrence in the land of Havilah, Mr. Watt, in the book before us, goes on to give an account of the alchemists and their efforts to transmute the baser metals. He then enters into the mineralogy and metallurgy of gold, and gives an account of the processes of assaying and coining the precious metal. Then a chapter on jewellers' alloys is followed by one on gold-beating; as is that in turn by another on its uses in the arts. After this the chemistry of gold is treated of, as is subsequently the composition of the various imitations of it. A collection of notes and anecdotes on the subject completes the volume, which is at once interesting and instructive.

The Mahdi, Past and Present. By Professor JAMES DARMESTETER. (London: T. Fisher Unwin. 1885.)—"The Mahdi" has become such a household word in the mouth of every reader of current newspaper literature that the very interesting little book whose title heads this notice should surely address a very extensive public indeed. Professor Darmesteter traces the origin of the idea of a Mahdi from its inception, and gives succinct histories of the various impostors and fanatics who have arisen from time to time to play that *rôle* in the World of Islam; concluding with an account of Mohammed Ahmed, whose star is seemingly beginning to wane in the Soudan. The comparative theologian will find much to ponder over in this small volume, which has been admirably translated from the original French by Miss Ada S. Ballin; who also contributes some notes and an appendix which is far from being the least interesting part of the work. It is difficult to read unmoved the account of the siege of Khartoum with which she concludes. When time removes this pitiable story from the obscuring influence of party polemics, and it becomes history, the desertion of that most gallant Christian Hero, Gordon, by the English Government must cover them with ineradicable infamy.

Walks in Epping Forest. By PERCY LINDLEY. (London: 123, Fleet-street. 1885.)—Mr. Lindley has succeeded in producing a book which, when we regard its almost nominal cost, can only be described as a surprising one. The geology, topography, antiquities, and artistic beauties of Epping Forest are treated of as fully as they can be for the tourist's purpose; and a large number of really excellent and picturesque engravings of the most beautiful views and interesting objects within its boundaries, together with a capital map, adorn the small volume before us. Every Londoner should buy Mr. Lindley's extraordinarily cheap guide forthwith, and learn how much that is wild and beautiful, as well as historically interesting, there is within half-an-hour's railway journey of the metropolis.

Short Essays, Original and Selected. (London: Moffatt & Paige.)—This is a series of essays intended as models for the unfortunate youths who have to furnish such themes in their "exams;" and it seems sufficiently well adapted for this purpose. The concluding chapter on "Faulty Expression" may be profitably consulted by a considerable proportion of the letter-writers of the present day.

Nobody's Boy, by DANIEL DARLINGHURST. (London: Jarrold & Sons.)—If we were asked to give, in the fewest possible words, an idea of Mr. Darlinghurst's tale, we should say, borrowing a phrase from the microscopist, that it was like one of Dr. Barnardo's stories magnified about twelve diameters.

Memoir of Daniel Cooper. By J. M. WEYLLAND. (London: Morgan & Scott. 1885.)—This is the biography of a man, who, apparently beginning life as a linendraper's shopman, ultimately turned his attention to the conversion of women leading a sinful life. The style and character of the book may be pretty well grasped from this indication of its subject.

ERRATUM.—At page 507, first column, in the last line but two of Mr. Clodd's review of "Prehistoric America," "anthochthonous" should have been printed "autochthonous."

TAKING DOWN A CHIMNEY.—A mill chimney in the United States was recently taken down in the following manner:—The proximity of buildings limited it to falling in one direction. About eight feet from the ground a recess was cut across the side of the chimney and heavy timber shores braced against the chimney. The chimney was cut away beneath the side supported by this timber. Holes were bored in the timber midway between the ends and illuminating coal-oil poured into these holes until the timber was thoroughly impregnated with oil. It was then set on fire, and when too weak to support the load of half the chimney it fell in the desired direction.—*Engineering*.

THE FACE OF THE SKY.

FROM JUNE 19 TO JULY 3.

BY F.R.A.S.

THE usual daily examination of the Sun will be made, whenever he is visible, for spots and faculæ which have quite recently become splendidly developed again. The night sky will be found delineated on Maps VI. and VII. of "The Stars in their Seasons." As we stated a fortnight ago, there is now no real night. Mercury is a morning star, but towards the end of the next fortnight is too near the Sun to be fairly observable; in fact, on the 27th, he comes into superior conjunction with the Sun. Venus is an evening star, and at the beginning of July may be caught by the naked eye, after sunset, glittering over the W.N.W. quarter of the horizon. Mars, Saturn, and Neptune are all invisible. Jupiter is rapidly approaching the west, and must be looked for the moment the twilight deepens sufficiently for him to be visible. The phenomena of his satellites, now certainly visible, are but few and far between indeed. Omitting those occurring in bright twilight and when the planet is close to the horizon, there remain, on the 22nd, the egress of the shadow of Satellite I., at 9h. 53m.; and on the 29th, the ingress of the shadow of the same satellite at 9h. 28m. Uranus is in what is called "quadrature" with the Sun at 2 a.m. on the 20th—*i.e.*, the two bodies differ 90° in longitude. He is still to be found roughly on a line between β and η Virginis. Like Jupiter, he must be looked for the instant it gets dusk. The Moon enters her first quarter at 1h. 48·5m. this afternoon, and is full at 11h. 17·9m. a.m. on the 27th. The solitary occultation which occurs during our prescribed hours is of the sixth magnitude star, 13 Capricorni, which will disappear at the [Moon's bright limb at midnight on the 29th, at an angle of 119° from her vertex, reappearing at 1h. 7m. the next morning at the dark limb, at a vertical angle of 239°. The Moon is in Virgo when our notes begin, and continues to travel through that constellation until 11 a.m. on the 22nd, when she enters Libra. At noon on the 24th she emerges into the narrow northern strip of Scorpio, which it takes her until 10 o'clock the same night to traverse. At the last-named hour she emerges in Ophiuchus. At 8 p.m. on the 26th she leaves Ophiuchus for Sagittarius, her path across which is completed by 11 a.m. on the 29th. She then enters Aquarius, through which she continues to travel until noon on July 3, when she crosses into Pisces. There we leave her.

LICENSED EXPERIMENTAL PHYSIOLOGY.—In a Parliamentary return just issued relating to experiments on living animals, Inspector-General Bush reports that 49 persons held licenses during 1884, and the total number of experiments of all kinds performed was about 441. The animals operated upon were all rendered insensible during the experiments. Of 145 experiments 99 consisted in simple inoculation with a morbid virus. Of the remaining 46 experiments under these certificates, 24 were performed for the purpose of medico-legal inquiries in cases of suspected poisoning, resulting in the death by tetanus of three frogs and six mice, which survived, however, only a few minutes; ten other cases under the same head were experiments on the infection of fish with a species of fungus, very destructive in certain rivers and streams; and five on the effects of immersion of fish in distilled water, which proved fatal to about thirty minnows and sticklebacks. These returns *should* satisfy the most rabid anti-vivisectionists, but they *won't*. A strongly-worded protest in favour of the poor little minnows and sticklebacks will certainly result.—*Medical Press and Circular.*

SOME time ago Mr. Bayley showed that when drops of various solutions are allowed to fall on to filter-paper, the salt which was in solution in many cases remains in the centre, and a water ring extends around it. Mr. J. U. Lloyd has extended these observations, and a notice of them has been given in the *Chemical News*. He has observed the distances to which various substances in aqueous solutions extend on pieces of blotting-paper, dipped into the solutions, before they are left behind by the water. Great differences were noticed in the length to which different salts thus travelled. Mixtures of salts were also examined; in some cases one salt passes on, leaving the other completely behind. Thus a solution of quinine and berberine sulphates was separated by the method described; the former salt passed on through the paper after the progress of the latter had quite ceased. Dilute sulphuric acid behaved similarly; pure water alone passed onwards. In the case of simple salts dissolved in water, the rule appears to be that the more dilute the solution the quicker is the separation into salt and water.

"Let Knowledge grow from more to more."—ALFRED TENNYSON.

Only a small proportion of Letters received can possibly be inserted. Correspondents must not be offended, therefore, should their letters not appear.

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BRILLIANT GLOW AT MIDNIGHT.

[1758]—On the night of June 12–13, at a few minutes past eleven, looking from a height (406 ft. above sea-level) near Forest Row, Sussex, a bright pearly glow was seen a few degrees west of north, streaming up from the horizon like the prelude of a fine moonrise. It gradually extended towards north-east, and at midnight presented a very luminous appearance as far as about 15° east of north. The light was very steady. The sky was clear in all directions, and the stars brilliant. According to the almanack, sunrise on the 14th occurred at 3h. 44m. a.m., and moonrise at 5h. 45m. HENRY J. SLACK.

VITAL FORCE.

[1759]—What, in the name of patience, does a certain set of persons wish to make of the universe? Those who deny any external existence, and therefore the existence of all but their own minds—I was about to write brains, but that brains, from their point of view, are also phantoms of their own conception—must remain satisfied with their own deification, as head centres of their chimerical worlds, with their egoistic "l'état, c'est moi." As for matter and force, these are, according to their own doctrine, also phantasma of their consciousness. Their own *vera causa* is the all-sufficient ego, and nothing more can be said.

But to those captious, discontented reasoners, who believe in the existence of an external world, in the existence of others besides themselves, and in force, yet who would, nevertheless, destroy all other beliefs, I repeat the question, What, in the name of patience, do you want to prove? There is the power, there is the mechanism by which all is accomplished that excites men's wonder and admiration, are you satisfied with the universe as it is, or are you not? Is it a matter of any great importance what name men shall confer on the Supreme Potentiality? Can you alter the constitution of the Cosmos, or will it proceed on its eternal purpose in spite of you? Are you satisfied with the working of your own minds, and do you think yourselves very clever? Are you convinced that mind is the product of force and organism—what then? Cannot you rise to the conception of a mind infinitely beyond your own, of which the whole universe may be the necessary substratum, of a living universe in which all force is vital force and in which all dynamics are vital dynamics?

When we speak of a vital force we do not speak of a special force wandering about, but of a vital force ever present to vivify when the conditions of organisation are suitably conformed for that purpose. But matter cannot organise itself, it can only be organised by an intelligent direction of power. *Vis insita* is only another name for the power indwelling in the universe uncreated and indestructible.

What step can man's little intelligence take with regard to organisation beyond that of the mere contrivance of mechanism which cannot live? Men cannot by taking thought make anything which force can vivify. And yet the most wonderful forms of life teem forth perfectly organised, living, moving, and having their being, we know not how.

Moreover, is science omniscient that it should dare to enunciate the constitution of nature? There are mysteries that science is as unable to probe as ever—viz., gravitation, colour, sound, &c., &c. Colour and sound, though caused by vibrations, are not inherent in the vibrations. If sound and colour really have any external

existence, the present accepted theories of light and sound are inadequate to explain the facts. If, on the other hand, the theories are correct, then colour and sound are products of our inner nature, are sensations that cannot be explained. The same reasoning may be applied to the sensations of heat, cold, &c., &c.

Do not seek, then, to destroy people's reverence, do not rob the world of hope, do not deprive men of all that sanctifies endeavour—of a belief in that supreme rule which alone constitutes right and wrong, and which alone affords any valid reason against a man doing just as he chooses. METER.

ULTRA-GAS.

[1760]—This ("F. W. H." 1733) has nothing to do with the old guesses about ether, luminous fluid, &c.

Starting from the (recent ?) discovery that the attraction of gaseous particles for each other is insignificant: seeing that that is the case also with the fixed stars reciprocally: I said, What if *they are the molecules of a universal gas?* In that case there would be between them, not ether, &c, but *absolute void*. But *what then is the gas?*

The molecules of an ether would be even smaller than those of hydrogen. *I* suggest a gas of which the sun would be a *very small molecule*. This idea (certainly large) seems to have been too bulky for comprehension. HALLYARDS.

IDEALISM.

[1761]—In reply to "J. S." (1738), let me say that I do *not* "assume the non-correspondence of concepts with the things conceived." If by "thing" "J. S." means "object"—*i.e.*, a group or synthesis of sensations—then every valid "concept" must certainty be correspondent with a "thing." But unless the "thing" be an "object" as above defined, "correspondence," in the sense of similarity, becomes a meaningless predicate. No concept can possibly resemble a hypothetical cause of sensation, which in itself is neither sensation nor thought. C. N.

MEMORY AND IMMORTALITY.

[1762]—Anent a letter, 1732, by Mr. R. S. Stanley, the "certainty" of the immortality of the "soul" is rested upon the fact of an old lady recollecting things she had forgotten for a long time. Is this not a proof, on the contrary, that "soul" is not an "entity," but action partly conscious, partly unconscious, voluntary or involuntary of the brain? I have often repeatedly endeavoured to recollect things of "great importance" without being able to do so, while at the same moment most trivial occurrences came to my memory without effort. I have seen several friends die of old age who became shortly before death perfectly childish, one of them almost idiotic, in action and speech, representing to me the gradual fading away of the power of thinking, loss of memory, and will. If, then, the soul, mind, thought be immortal—*i.e.*, independent of our bodies, which we know decay and are absorbed in nature's great reservoir, what state will it be in, the child's, youth, adult, or senile old age? F. W. H.

EARLY MEMORIES.

[1763]—I quite agree with you [note on letter 1732] that an old person remembering an old circumstance, even long forgotten, can have no influence on the question whether we have a soul, or, if so, whether it is eternal. *That* no created thing ever can know. Were we all enjoying a happy eternity, some sceptical or downcast spirit would be sure to suggest "How do we all know it will last for ever"? To the most pious believer the reflection can hardly fail to occur "Is not the violent repugnance we all have to coming to an end a too, too likely origin of the hope that we never shall? Is not the foul injustice, and the useless pain we suffer here a certain cause of the trust that in some other state right will be meted to us for wrong, bliss for pain?" I myself never felt this reasoning so strongly as when I thirsted for an occasion of martyrdom. I never could sympathise with the cock-sure.

Your souvenirs of your third year remind me of the question, Why do we remember certain things—mere trifles—and not great things, which happened at the same time or later? I asked my mother once how old I was when a kitten fell into our hall and broke its spine. She said it was *impossible* I could remember it—because I was only eighteen months old. Yet I do remember the position in the hall of all the persons there—that I understood what they said, and was vexed I could not join (I said my first word a month or so after)—Now, my horror at the poor kitten's fate accounts for this being my first memory—(Would a child, as soon as old enough to swear, be received as sole witness of a murder he had seen committed, but could not divulge at the time, not knowing any speech?)—But why should I remember still more distinctly plucking potato-apples in the garden one fine day, very hot, running through the house, and throwing them into a pond? That happened when I was just two, and is fixed by my recollection that my father was seriously ill. Yet it is a circumstance of no importance. I remember when confined by a bar at table thinking my aunt dreadfully affected because she said "Is it not?" whereas we more commonly heard "Isn't it?"

Many of our childish memories are perhaps like Mr. Galton's composite photographs—they are the concrete result of acts frequently repeated. Thus, I recall piano, violoncello, and glees; but I do not think I remember any one occasion of these family concerts. I remember the Queen's accession, when I was not yet five, because there were minute-bells all one day, peals all the next; but, strange to say, I do not remember my eldest uncle's death in the same year, though it was a much more important event to us. I remember how I learned the word "son." I woke up one evening (it was still daylight, and I was still "the baby"—so I must have been not older than three months under three) screaming violently, in the greatest agony. Everybody rushed upstairs, and I heard my mother cry on coming "Oh, my son, my son!" Strange to say, in spite of my sore plight I was interested still to learn that I stood in that relation to her. I had never heard the word "son" and thought it a "prow title." I had been seized by a spasm in the throat, rendering respiration all but impossible. My mother was frequently in danger of sudden death from this; but (curious fact) I never had any such thing save that once (though probably I shall have yet). HALLYARDS.

IS THOUGHT AN ENTITY?

[1764]—One may so far agree with Haeckel, Buchner, and "other eminent German scientists" as to admit (what, indeed, science shows to be a mere truism) that the mind is a function of the brain, and not an independent entity, without following those "extreme" Materialists into the domain of dogmatic negation. It may be said that man cannot get beyond phenomena, and that the force behind nature is an unknown quantity, but in that unknown force is comprised the whole solution of the problem of existence; but Materialists of the school above mentioned treat the unknown quantity as though it were no factor at all in the case.

"F. W. H.'s" simile of thought being comparable to the scent of a flower or the reflection of an object in a glass is unsatisfactory for the simple reason given by John Stuart Mill, that "mind (or whatever name we give to what is implied in consciousness of a continued series of feelings) is, in a philosophical point of view, the only reality of which we have any evidence, and no analogy can be recognised or comparison made between it and other realities, because there are no other known realities to compare it with." If the simile holds good, it can only be so far that the scent correlates the impressions formed by the mind, to which expression is given. "Thought, mind, or soul," says "F. W. H." "must be the *effect* of stimuli acting on living, self-acting brain." If he means that (in the words of Montaigne) man is not here to work, but to be *worked upon*, I agree in the sense that we all fulfil the law of our being. But why regard soul as perishable when the atoms of matter are imperishable? soul being the intangible, yet real, force of every living organism, just as the oversoul is of the universe. H. A. BULLEY.

GEORGE ELIOT SETTLING IT.

[1765]—Without dealing here with "Commentator's" preliminary rhodomontade about George Eliot, except to point out to him that the value of any one's work and scientific opinions is not usually estimated according to their moral conduct and opinions, might I ask him to give scientific proof of his assertion that "Matter *always was* and *always will be?*" Surely upon such a question as this, which must be always beyond man's ken, he shows too much of that "cock sureness" which he finds so repulsive in George Eliot.

Secondly, let "Commentator" prove the "fact of apparitions after death," before he asks for an explanation of such *fact* (?).

A. FOUNTAIN.

EVOLUTION.

[1766]—"Commentator's" protest against "conventional evolution" will meet with considerable sympathy from a large circle of careful thinkers. The Darwinian hypothesis is now passing through a most *un*scientific phase of its existence. Having started upon a splendid structure of fact, it is now endeavouring to win fresh domains upon such poor stuffs as "may be's" and "possibly's." Every Darwinian enthusiast seems anxious to show how plastic the theory is, and how it can be made to cover nearly everything.

What doctrine, I should like to know, with full liberty to indulge in "may be's," &c., would not do the same? Let the believer in Special Creation possess the same advantages, and what could he not explain?

Evolution owes its strength and popularity to carefully-examined facts, and to make its influence more universal, its advocates should not stoop to weapons disallowed to its opponents. The theory has yet to overcome enormous difficulties before it can rank as a universal law. It may win its way to a place by the side of gravitation, but to do so it will have to depend upon something else than "may be's" and "possibly's." Thanking "Commentator" for his able letter,

GAMMA.

[1767]—You said lately in answer to a correspondent that it is as absurd to deny the truth of evolution as to deny the sun at noonday.

It would be a great boon to me—perhaps to others—if you would give a series of papers summing up in a really first-rate, exhaustive style, all that has been *established* on this subject.

I have never read its classical literature (Darwin, &c.) and despair of ever doing so—for it would cost me over ten pounds a year to have books from England. Many men who have not this obstacle are yet unable to get a conspectus of the matter, from absorption in business, &c.

I have read much *about* evolution—but am no better off than would be a Pagan who had lived much with Christians, but never read a word of the Bible.

All that I have been able to seize in this cursory way is that there is abundant evidence of adaptability to circumstances on the part of animals and plants; but nothing like a proof of what I presume ought to be believed, because the majority of the best minds have received it.

When we walk too much, our feet blister. The process is this. A given part of the cuticle has too much work, gets inflamed, *i.e.*, diseased. Then the blood detaches from itself a supply of water, pushes this under the distressed cuticle, forms a water-bed, and so saves the *inner* skin at least from grievous harm.

Now, it was not the brain which ordered this process; for the subject is generally unconscious of the harm till the blister is formed. And it would be absurd to attribute to the *blood* such a high intelligence as the process implies.

I am therefore driven to conclude that the organism was launched at first with a faculty of forming external blows to a certain extent; but I cannot see I should be right in saying it had *developed*, or *evolved*, a cushion of water "to save its bacon:" any more than when I see a snail mend its own shell, or a spider its web.

Bread (alone, I believe, of foods) has its digestion finished, not in the stomach, but in the duodenum. Since cats ate bread, they have adapted their intestines to circumstances, so that the tame cat does not cut up like the wild. This would be now called development; but does not "adaptibility" fit the fact quite as well; and is the cat's duodenum different in *kind* from the water in a blister?

Were this granted, I can conceive (but "I speak as a fool") that it might be pushed to the conclusion of all the changes in organic life that have been recorded.

Again, I wish to know why, because there were once hipparia, and now are horses, and the latter look like an improved edition of the former, it should be concluded that at some given date a hipparion became a horse.

I desire to learn how the process is held to have taken place *in praxi*. Is it supposed that of a pair of say, Missing Links, there was born a man? or, about the same time, a man and a woman; and did these *chance* to choose each other for mates? In any case, the first men must have had very near relations who were not human at all.

So far as I can gather, it is held that desire and energy were the prime causes of improvements taking place in individuals. My difficulty about this is the sad case of the ill-favoured. The cultured brain of the head-creature spares no pains, no study before the mirror, to turn a plain face into a handsome one; yet the result is ever *nil*. How hard then to see how *inferior* creatures acquired all they wished for! Stranger still, children of the same parents may be so like as to be taken one for the other, yet one be ugly, the other pretty; so there was not *much* to do to get beautiful: but "a miss is as good as a mile." And this obstinate adherence to some ancient type persists for two generations. One of the noblest families of England has always been ill-favoured, as the family portraits prove. If all animals were originally aquatic, how curious that *all* did not desire and obtain the power of rising into the air? Men must long ago have wished to fly; yet even now we can't do it, with all our appliances. Were the porcupine and hedgehog alone sharp enough to see the advantage of a coat of spines?

Anyhow—I suppose that if I read enough I should believe in evolution as you do; but what I never shall be able to stomach is the indecent joy with which the small fry of science rush back to the ancestral sty, and wallow grunting in the ennobling thought that we have no need to *make* beasts of ourselves, because beasts we were, and beasts we might have remained, had it not been for our persistent cleverness.* I may be forced to agree that Newton or Shakespeare's first human ancestor was the son of a gibbering baboon; but the thought will always be as painful to me as if, nursed in a palace, I were convinced beyond doubting that I had been changed at nurse, and was but the child of a churl.

HALLYARDS.

[Without attempting to deal *seriatim* with our correspondent's various points, I would suggest to him the perusal of Schmidt's "Doctrine of Descent and Darwinism," which forms Vol. XII. of the "International Scientific Series." It should not cost him more than six or seven francs post-free, and it contains as good a *précis* of the facts on which the theory of evolution is founded as I am acquainted with.—ED.]

THE WEAK POINT OF DARWINISM.

[1768]—"Commentator" (1734) should read Mr. St. George Mivart's "Genesis of Species," which puts very clearly the "weak point of Darwinism." There must be a flaw in all evolutional theories, till we have some conception of the laws of what is called spontaneous or accidental variation. The "external factor" in evolution consists of the direct or the indirect action of the environment. In the former case, we call the resulting changes "adaptations;" in the latter, we say that they are the outcome of "natural selection." But of the internal factor (*i.e.*, the physiological causes which determine the development of a given group of organisms in a given direction), we can as yet form no idea. The wisest course is to use such knowledge as we have, frankly confessing that it does not give a full explanation.

May I suggest that "Commentator" would do well to lay to heart a certain line which he quotes (1740), before passing contemptuous judgment on the character and intellect of a great writer.

CONSTANCE C. W. NADEN.

THOUGHT-READING.

[1769]—In continuation of a former letter on the subject, there is, I would remark, a class of phenomena which seem to bear on the matter under discussion. I mean those with which the proverb, "Talk of the ——," is connected. Nothing, I fear, will ever convince me that the appearance of a person, simultaneously with the mention of his name, is always a mere coincidence. It seems to me we must admit that unconsciously we are able to detect the presence of a person without using the senses of seeing or hearing, possibly by some modification of the sense of touch, not unsimilar to that by which a blind person distinguishes colour, or possibly by what in the dog we call "scent." Those who have good sight and keen hearing little know to what uses the sense of touch may be put.

Whether we see a cannon fired or hear the report, the same idea is produced in the mind—a cannon has been fired. There are many other ways by which the same idea may be produced, viz., the smell of powder, or even the taste of it, or by touching the breach and finding it hot; but, in every case, either an ether wave or a molecule in motion produces in the brain a molecular movement. There is, apparently, no third way. As a rule, the shorter ether waves are only distinguished by the eye. I say, as a rule, as the blind man seems able to distinguish them by the sense of touch. The longer, or heat waves, most can distinguish by the sense of touch. Now, besides the light and heat waves there are other waves in the ether, and, at any rate, some of them seem to pass through certain substances much in the same way as the light waves pass through transparent substances, producing the same effect, or nearly so, at the end of their course as at the beginning. Our knowledge of some of these waves, say the electricity waves, is apparently only indirect. We see the effect produced, but cannot by our senses detect the cause. We have no special organ for electrical phenomena, as we have for those of light. We are much in the same state in reference to electricity as we should be in respect to light if the human race was blind. Now, let us for the moment suppose that certain brains have a rudimentary sense of electricity, odic force, or whatever one may choose to call it, which in an imperfect way could receive impres-

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* *On ne parle pas d'une corde dans la maison d'un pendu.* How crest-fallen shall we feel anon—we armorial (and arboreal) people—when we look on our *genealogical trees*, and reflect that were the whole truth portrayed, the *real* founder of the line should be "settled in tail male" at the first parting of the trunk!

sions from another brain, and yet be conscious only of the effect produced, just as we sometimes have a singing in our ears and do not know whether it is produced externally or internally, would not such a sense account for all the phenomena of thought-reading and muscle-reading, besides such every-day occurrences as mentioning a person's name on his approach, two persons changing step at the same time, and two persons turning to look back at one another at precisely the same moment? Let us apply this theory to the commoner, and also to the less common, phenomena of thought-reading. The electro-biologist mesmerises a certain number of persons by a mechanical process. In this state their ordinary senses are more or less inactive, but a new sense is apparently aroused. This new sense is able to comprehend the wishes of another person. On the stage, these wishes are generally expressed in words; but this is for the benefit of the audience, as the subject mesmerised is apparently deaf and blind for the time being. The spirit medium seems to be a person in this state.* Mr. Stuart Cumberland, as far as I can gather from the reports of his performances, thinks it necessary to be touching the person whose thoughts he reads, and he himself at the same time has his ordinary senses about him. Now, if the theory of thought-reading is correct, it is easy to see how Mr. Labouchere might safely make the bet about the five-pound note under certain conditions, for, supposing no one knew the number of the note, not even Mr. Labouchere himself, there would be no thought to read, and yet Mr. Bishop would not necessarily be an impostor. I once saw an impostor detected thus: He borrowed a watch from one of the audience, but, before doing so, asked the owner to look at the number and remember it. Unfortunately the watch had two numbers, and the conjuror guessed (?) the wrong one. On the other hand, one of the most remarkable experiments of those conducted by the committee of the S.P.R. is that in which Mr. Blackburne did not correctly remember the diagram, and Mr. Smith reproduced Mr. Blackburne's incorrect idea. Had the conjuror referred to above been a thought-reader, he would have read the correct number or none at all. But this is self-evident; the question is, "Is there sufficient circumstantial evidence to warrant the supposition that there is a rudimentary sense of thought-hearing, thought-sight, or thought-touch?"

I am not certain that this sense, ordinarily dormant, would not account also for the phenomena of double consciousness, as it is called. We do not necessarily connect in our memory the phenomena observed by one sense with those observed by another, although the cause may be the same. For instance, we may associate a certain combination of ideas with the ticking of a clock, which the sight of the clock would never arouse. If the ordinarily dormant sense were the active one in the hypnotic state, the ideas aroused would be those connected with a former hypnotic state.

JOS. W. ALEXANDER.

[1770]—Mr. Blackburn, to whom I referred in my last letter [1735], was an Associate of the Society for Psychical Research. Mr. Smith was a young mesmerist. Mr. Blackburn had previously conducted many private experiments with Mr. Smith, but had been accustomed to hold Mr. Smith's hand or touch his forehead, so that the results of such prior experiments might have been explained on the muscle-reading hypothesis in preference to the thought-reading hypothesis.

The society always looks askance at the platform exhibitions of Mr. Irving Bishop and other paid mediums, who are certainly "peculiar,"

"For ways that are dark,
And for tricks that are vain."

Believers in "thought-transference" prefer to rest their case on the results of experiments carried on in private under test conditions. For the accounts of these experiments I must refer readers of KNOWLEDGE to the "Proceedings of the S.P.R," as I do not like to encroach too much on your already over-burdened columns. Otherwise I should have liked to refer more fully to the experiments with Messrs. Blackburn and Smith, and also to those carried on by the Rev. A. M. Creery with his own children, and by Mr. Malcolm Guthrie and some friends, at Liverpool, with two young ladies who were well-known to Mr. Guthrie. To hint at collusion in these cases would be absurd, and any one who makes a careful study of the results of these experiments will, I am sure, be convinced that the S.P.R. have made out a very "strong *primâ-facie* case for the possibility of the molecular motion of the grey matter of our brain exciting corresponding movements in that of another."

A. FOUNTAIN.

* If Mr. Alexander had had the same experience of "Spirit Mediums" that I have, he might and would find a very much less recondite explanation of *their* performances.—ED.

"THOUGHT-READING" (?).

[1771]—I was glad to see, in your issue of May 22, Mr. N. G. Munro's eminently sensible explanation of the manner in which "pin-finding" and other feats of muscle-reading are performed. The same points have been urged almost *ad nauseam* during the last few years in the Reports of the Society for Psychical Research, but as long as the confusion between "mind-reading" and "muscle-reading" continues to be met with, the explanation must continue to be repeated. It is specially necessary to insist (as we have always done, and as Mr. Munro now does) on two facts—that physical signs may be both given and received unconsciously, and that unconscious physical signs may pass otherwise than through contact. But Mr. Munro seems somewhat to have underestimated the means of this unconscious signalling. He dwells only on "the lineaments of the body," on gestures which may be read by the eye. But if that was the only danger it could be oviated by blind-folding the would-be percipient. A more important channel of unconscious communication is sound. If the "willer" is following the "willed" person about the room, his manner of walking, or even of breathing, may be a quite sufficient guide; for slight indications of pleasure, or disappointment, or expectancy, may thus be given, and these are practically "Yes" or "No" hints, which, so to speak, mould the subject's course for him from moment to moment. And we may lay it down as a general rule that no experiments where an action is to be performed, and where the "willer" is watching the subject's efforts to perform it, can have any value as a test of "thought-reading," which we define as the transference of ideas from one mind to another otherwise than through the recognised channels of sense.

The best experiments to try are as follows:—First, let the would-be percipient, instead of having something to *do* (such as finding a pin or writing down the number of a bank-note), have something to *say*. For instance, let A draw a card at random out of a pack, and concentrate his attention on it in perfect silence; and let B, who is sitting at a little distance, and out of sight of the card, try to guess what it is. There is one form of this experiment, lately introduced by the celebrated French *savant*, M. Richet, which we are especially anxious to see widely taken up. (See "Proceedings of the S.P.R.," Part VII., pp. 241–3. Trübner & Co.) Two persons, A and B, agree to make a thousand trials, fifty a day. The daily fifty will be found to occupy ten minutes or less. A takes in his hands a pack of cards from which the picture-cards have been removed; he makes a random cut, whereby some card is brought to the surface; he contemplates this card. B, who is seated so that he cannot even by inadvertence catch a glimpse of the face of the pack, makes a guess at the suit. He is either right or wrong. If he is right, A makes an upright mark on a sheet of foolscap; if he is wrong, A makes a horizontal mark. This is all over in a few seconds. The operation is then repeated with another card brought to the surface of the pack by another random cut; and the mark of right or wrong is duly put under the first mark. At the end of the day's trial there will be a column of fifty marks. A goes through them, making crosses of the upright marks by putting a stroke through them, and counting the crosses thus made. The number of crosses is the number of right guesses; and this number is recorded at the bottom of the column. At the end of twenty days there will have been 1,000 guesses, and the bottom numbers, added together, give the total of right guesses. The most probable number of right guesses for pure chance to bring about is, of course, one-fourth of the whole number (there being always one chance in four of guessing the suit correctly), that is 250. If the number of right guesses actually attained exceeds 250, this excess might, of course, be accidental; but if a hundred couples of people can be induced to do what I have described, and if the total of right guesses exceeds 250 in all the cases, or in a very large proportion of the cases, then there will be some reason to think that something beyond chance has been at work; in other words, that some of B's guesses have been right, owing to the fact that A, sitting near him, was concentrating his attention on the pips of a particular suit. And if this form of experiment were repeated again and again always, or almost always, with the result that the right guesses exceeded 250, the hypothesis that "thought-transference" had operated would receive ever-increasing confirmation. The great advantage of this form of experiment is that it enables persons who possess the faculty of thought-transference in only a slight degree to accumulate valuable results. We should be glad to have trials made in every educated family in the kingdom.

The second form of experiment that I would recommend is suited only to persons who possess the faculty of thought-transference in an exceptional degree. The "agent" draws a diagram of some irregular shape, and contemplates it; and the "percipient," sitting out of sight of the diagram, waits till he seems to get an impression of what its shape is, and then reproduces his impression on a

piece of paper in front of him. It is important that A should not watch B's performance.

If B.'s diagram in a number of instances strongly resembles A.'s, we have a very strong indication that B.'s impression was due to the idea in A.'s mind. (See especially the examples engraved in the Proceedings of the S.P.R., Part V., 33-42, and Prof. Oliver Lodge's paper on the subject, Part VI. p. 189.)

I shall be most grateful to any of your readers who will make experiments of the types described. The results should be sent to me at 14, Deans-yard, S.W. In the card experiments, *negative* results—*i.e.*, cases where the total of right guesses has *not* exceeded 250 out of the 1,000 trials—should, of course, be sent as well as positive.

EDMUND GURNEY,
Hon. Sec. for the Society of Psychical Research.

A PARADOX.

[1772]—It has often been said, "There is nothing so false as facts, except figures." Now here I send you a paradox involving both facts and figures, and I have never yet met with any one who could give me a satisfactory explanation of the contradiction involved in it.

We say every child has two grandfathers, four great-grandfathers, and eight great-great-grandfathers, and so on. Now we have only to carry the computation back a few hundred generations, and to furnish these ancestors we should require a population greater than could possibly have existed on the earth at one time.

Again, suppose I and my wife, and my friend Jones and his wife, emigrate to an uninhabited island and colonise it. Our grandchildren will each have two grandfathers, and our great-grandchildren *ought to have* four great-grandfathers; but in actual fact they have only two, viz., myself and Jones. Our great-great-children will require each eight great-great-grandfathers, but in fact have only two. Can any of your readers explain how it is that fact and theory so flatly contradict each other?

COLEFORD.

THE GEOLOGY OF CHARNWOOD FOREST.

[1773]—Several friends and myself have been induced by Mr. Harrison's interesting papers to pay several visits to this instructive geological district. In Brazil Wood, we found what appeared to be the junction between the syenite and the slate, mentioned by Mr. Harrison. We could only find one quarry in the wood, in the only section of which we found the apparent junction. Would Mr. Harrison kindly say if this would be the one which he mentions. Certainly in this section we saw a coarsely crystalline rock (presumably the syenite), passing into a finely crystalline and then into a slaty-schistose rock, and this within the range of a few feet. In a single specimen which I obtained there is a well-marked gradation from a coarse to a finely crystalline rock.

On the ridge overlooking the quarry at Mount Sorrel there is a section exposing the granite, which has "weathered" to a depth of ten or more feet. Overlying this there is a layer of subsoil, and over this a stratum of pebbles and gravel, in the lower portion of which we found a number of fragments of bones and unglazed earthenware and tiles (the latter from an inch to an inch and a quarter in thickness) which do not appear to be modern. There is some six inches of subsoil overlying this bed. We are somewhat puzzled how to account for this occurrence of pebbles and gravel. Has Mr. Harrison noticed the section, and if so, would he kindly favour us with his opinion.

GEO. FLETCHER.

PHOSPHORESCENCE.

[1774]—Near to my house there is an avenue of lime-trees, the growth of which is so luxuriant that the foliage almost shuts out the direct rays of light, and in this avenue, at half-past ten last night, I noticed a phenomenon that you may esteem worthy of chronicling.

The direction of my walk was northerly, and I noticed that the leaves, and the air in their vicinity, were suffused with a soft, faint, phosphorescent light. This for a time I attributed to the vapour from the wet leaves being illuminated by the moonlit clouds at my back, but, to settle my doubts, I examined a dense mass of trees *from their shady side*, and found the light still distinctly visible, but, I think, not attributable to the moon.

I believe some flowers are said to emit light. Are trees known to possess this power, and have the causes been unravelled?

A. S. BARNES.

THE DERMESTES.

[1775]—In connection with Mr. E. A. Butler's article on the "Dermestidæ," I think that some of your readers may find to be interesting the enclosed extract from O. W. Holmes's "Poet at the Breakfast-table":—

"'Will you let me look at that book a single minute?' said the Scarabee.

"I passed it to him, wondering what in the world he wanted of 'Paradise Lost.'

"'*Dermestes lardarius*,' he said, pointing to a place where the edge of one side of the outer cover had been slightly tasted by some insect. 'Very fond of leather while they're in the larva state.'

"'Damage the goods as bad as mice,' said the salesman.'

"'Eat half the binding off folio 67,' said the Registrar of Deeds. 'Something did, anyhow, and it wasn't mice. Found the shelf covered with little hairy cases belonging to something or other that had no business there.'

"'Skins of the *Dermestes lardarius*,' said the Scarabee. 'You can always tell them by those brown hairy coats. That's the name to give them.'

"'What good does it do to give 'em a name after they've eat the binding off my folios?' asked the Registrar of Deeds.

"The Scarabee had too much respect for science to answer such a question as that."

C. F. CLARKE.

OIL-GLANDS OF THE DUCK.

[1776]—In the article on "Philosophy of Clothing," page 451 of the present volume of KNOWLEDGE, Mr. Williams says of ducks:—"And I have read accounts of special oil-glands with which the animal is said to be supplied, and by means of which it oils its feathers in order to keep the water from wetting them." Can he doubt the fact? If so, I would recommend him to study the anatomy and habits, &c., of the duck, and more especially the beautiful articulation of the bones of the neck, after which I should imagine that Mr. Williams's remark about "a paint brush for them to oil their feathers," &c., would become quite superfluous. There is positively no "amount of learned pretention" required on the part of any one to prove the fact of the existence of oil-glands in all the duck family, and their method of distributing the oil on the feathers of the body. The whole paragraph suggests the idea that the writer is far more familiar with the bird when nicely browned fresh from the oven than when in her pristine condition.—G. A.

"DE GUSTIBUS."

[1777]—Please allow me to assure "An Old Draughtsman," that there was not the faintest particle of dynamite about my letter (1709). The only movement it was commissioned to convey was the very gentlest ripple. Although Fig. 9 does not show one of the commonest shapes for a picture-frame, still it is a form with which we are sufficiently familiar in the case of doors, windows, panels, niches, &c. Is it intended to be understood that the form shown in Fig. 10 is objectionable because of its rarity? Perhaps the owner of the glass could give a very satisfactory reason why he preferred to see it placed like Fig. 11, instead of like Fig. 12. I am sorry to have to differ from "An Old Draughtsman" as to the construction in Fig. 13. A building is not bound to be constructionally good because it does not fall down. For instance, it is quite possible to build a tall chimney so that it will seem at a considerable angle (in fact, many tall chimneys arrange that for themselves), and although that might be considered a *tour de force*, still it would be better construction to make it perpendicular.

Pardon my directing attention to the fact that in my comments on Fig. 5, I did instance a very old recognised class.

I quite agree with "An Old Draughtsman," that a chief source of the difficulty in investigating questions of taste lies in the confusion of the separate elements in the question. The fruits of the toil of many workers will have to be gathered yet before those elements can be sufficiently sorted out and arranged for the question of beauty or ugliness to become anything but a matter of taste.

J. B. C.

LETTERS RECEIVED AND SHORT ANSWERS.

J. S. T. W. I do not know of any quite recent one; but the "Cyclopædia of the Natural Sciences," published by Richard Griffin & Co., of Glasgow and London, is very good.—DR. LEWINS.

XUM

Until you can definitely prove, on scientific grounds, that mind and matter are eternal, I must persist in the belief that they must have had an origin, and there can be no more objection to call that origin God than to dub it a Solipsism, or anything else; and this even if heaven and hell be the veriest figments of the uncultured mind. Of course, Newton did write hopeless rubbish on theological subjects. It is notorious that he was actually insane at the time (1692-93) when, at Dr. Bentley's request, he wrote his four letters on the existence of the Deity. You are yourself, though, under a delusion about Sir George Airy. Your anecdote is so amusing that it really deserves reproduction; but it is scarcely suited for these columns.—E. COLPITTS ROBINSON requests it may be announced that he is *not* F.R.G.S., as erroneously stated in the review of his work on p. 482. I imagine that this was a misprint for F.E.G.S.—W. DUDLEY DINES. I regret that I am ignorant of the address of the makers of the Red Cross Pocket Ambulance. —F. W. H. Your friend was so far right that in every ocean in free communication with the Poles the temperature of the bottom layer of water is very little above, and sometimes even below, 32° Fahr. In the North Atlantic at 800 fathoms the temperature is 40° Fahr., and continues to sink as the depth grows greater. Oddly enough (at first sight), we get to the 40° stratum at 300 fathoms in the equatorial parts of the same ocean. The temperature of the water is considerably lower than that of the superficial parts of the earth's crust beneath it. See the reports of the *Challenger* expedition and Wyville Thompson's "Depths of the Sea" and "Atlantic."—R. PARKS. You should really consult a good solicitor. See, though, p. 258 of "Whitaker's Almanack" for this year, and form your own opinion from what you will read there and on the previous page.—J. J. COLLINS asks why on (what he calls) "the Development Theory," Jews, after forty centuries of circumcision aren't born circumcised? Well, perhaps the most immediately evident reason is that natural selection acts by perpetuating and developing variations *beneficial* to species in their struggle for existence. How far this savage rite can be held to benefit its victim in any such sense is perhaps not very apparent.—H. R. B. I have yet to learn that mere inconceivability, *ex necessitate*, "proves falsity in the premiss"; inasmuch as less than 400 years ago the motion of the earth was quite inconceivable to (practically) all mankind. You, however, remove the whole question under discussion out of the region of science into that of theology—whither I neither can nor will follow you.—JOHN ROBERTSON. Unless you can give me chapter and verse for your statistics, from the returns of the Registrar-General, I can take no notice of your communication. If they are extracted from any of the anti-vaccination books or pamphlets which I have read, they are utterly worthless, inasmuch as anything more shameless than the "cooking" of statistics in those publications I have never seen. That out of the thirty-eight men on board of the *Duncan* who became infected with small-pox by contagion, and were presumably all shut up together in the sick-bay of that ship, only one should have died (and we have no details as to whether he had been successfully vaccinated or not) seems to speak volumes in favour of vaccination. However, the crucial test is applied in the case of the medical officers and nurses of the small-pox hospitals, who, carefully and periodically vaccinated, enjoy absolute immunity from the loathsome disease which is raging around them.—J. MARSHALL. Buy "The Young Collector's Handbook of Butterflies," and "The Young Collector's Handbook of Beetles," by Kirby, published by Swan, Sonnenschein, & Co. They will cost you one penny each, and give you full instructions for preserving Lepidoptera and Coleoptera. I cannot call to mind just now the name of any book treating on the preservation of botanical specimens. For first-rate directions for preserving and mounting mammals, birds, batrachians, reptiles, and fish, get Maynard's "Manual of Taxidermy," reviewed on p. 292 of Volume V.—J. B. SCOTT. The determination of the heliographic latitude and longitude of a sun-spot is a process which cannot be simplified in the way you require. See Carrington's "Observations of Solar Spots," published, in 1863, by Williams & Norgate, London. During the short time a spot occupies in crossing the screen, it is travelling along a parallel of declination.—PROF. T. G. BONNEY and P. E. DOVE. Your invitation reached this office on Saturday, and me on Monday—too late, unfortunately, for me to avail myself of it.—THE MARQUIS OF HAMILTON, &c. In thanking you, I may ask you to read the previous reply as equally applicable.—PROTEA writes at too great length to deny that the service for the Restoration was either appointed by the Church of England, or was part of the Prayer Book! This, of course, involves the assumption that that Church is a kind of *imperium in imperio*, which but few people indeed, outside of the English Church Union, will be nowadays found to contend, or even to admit. She is in this country the Church of the State "by law established," and a service enacted by statute is as obligatory on her as one decided on by Convocation. The Parliament which decreed the one under discussion was a Parliament of churchmen, representing and elected by the churchmen of the kingdom; hence your contention that "the Church" had nothing to do with it seems to me the veriest logomachy. Your defence of Charles II. seems a little far-fetched. Surely the wholly unprincipled race of the Stuarts, from which he sprang, would suffice by mere inheritance to start him with a fair stock of vices. Lying, duplicity, and deceit, for example, he would inherit directly from his father.—R. CAMPBELL. Non-magnetisable watches are generally made with aluminium bronze for the lever and pallets, and a palladium balance-spring and gold balance; but, so far, no really effectively compensated balance has been devised into which steel does not enter as a component.—W. CAVE THOMAS. I regret the misprints as much as you can possibly do; but it is obviously impossible for me personally to read proof of all that appears here.—W. J. asks Mr. Browning whether Bown's two-speed gearing is good and suitable?—R. WILLIAMS. Forwarded as you request; but the address appears in full in our advertising columns every week.—HALLYARDS. It is not too late to cancel it now, and it shall be done. Believe me that my respect and esteem for you are too genuine to permit me ever to attempt any "application of the knout" in your case. The words which you regard in that light were not written especially for your behoof. I was fain to hope that they would meet the eye of certain critics who periodically favour me with instructions for the conduct of KNOWLEDGE, and are good enough to point out exactly what ought to appear in its columns and what should be expunged or omitted from them. Very strictly between ourselves, I quite agree with you in the subsequent part of your letter. — ARTHUR LUCAS, THE COUNCIL OF THE SOCIETY OF ARTS. Received with thanks.—METER. Will appear in due course. —THOS. F. TYERMAN. You should study Professor G. H. Darwin's exposition of his theory as to the manner in which the periods of lunar rotation and revolution came to be coincident. Your reference to "plans 3 and 4," is wholly unintelligible in the absence of those plans themselves.—THURSTON & Co. Received.—W. H. DAVIES sends this rather odd coincidence. On June 8, 1885, Mr. W. F. Denning, the eminent astronomer, and Mr. Calver, the well-known optician, were severally elected Associates of the Liverpool Astronomical Society. On June 8, eight years ago, the same two gentlemen were together elected Fellows of the Royal Astronomical Society. — DR. LEWINS. Admitting, for argument's sake, the irrefragable truth of all you advance, I must emphatically repeat that this is not the place in which it would be either proper or profitable to advance it. Why don't you start a journal devoted to the exposition of your ideas, yourself?—J. M. COATES. It may be taken that mean solar day is an invariable quantity; that in use among astronomers being 1·00273791 of a sidereal day which (*malgré* much which has been recently written) has never been *proved* to have varied during the time which has elapsed since records were first made. I know of no work treating in detail on this subject in the form in which you require it, but see pp. 186 to 191, inclusive, of the edition of "Brinkley's Astronomy," edited by Stubbs and Brünnow, and published by Longmans. The Solar year is very slowly diminishing in length now. Laplace reckoned that it was 10 seconds shorter than in the time of Hipparchus.—CHAS. W. NIND. Rightly or wrongly concubinage is grossly repugnant to English taste and ethics; and the mere circumstance that a person practising it happened to possess exceptional intellectual ability can in no sense be held to redeem it. What every one would join in denouncing in the woman who lives with Bill Sykes certainly gains no fresh grace—and, in fact, admits of even less palliation—when paraded by one whose mere education should have afforded some guarantee for deference to common decency. However, I have since received a letter from "Commentator" expressing his extreme regret that I did not suppress the passage to which you take exception; not, though, in least on the ground which you take; but less he might unwittingly have hurt the feelings of living relations and connections of the writer to whom it referred.—ALFRED HAY. If you, yourself, wish to learn something of the *scientific* value of the book you recommend to "Commentator," I strongly advise you to read the review of it by the late Professor Clifford, which appeared in the *Fortnightly Review* for June, 1875, and is reproduced in Volume I. of Clifford's "Lectures and Essays," published by Macmillan & Co. I have received an ANONYMOUS POST CARD asking me "to return the blue book of No. 5,401 $\frac{84}{25}$ to 25, Tower-street, Winchester." I have not the most distant conception to what this refers, what it means, or from whom it comes.—ALEX. MACKIE says that in letter 1,745, in writing "four-fifths of it being pure oxygen," he meant, one-fourth being pure oxygen. Also that in his peroration "slowly; but will," &c., should be "slowly but surely will," and that the final note of interrogation is not his.

Our Inventors' Column.

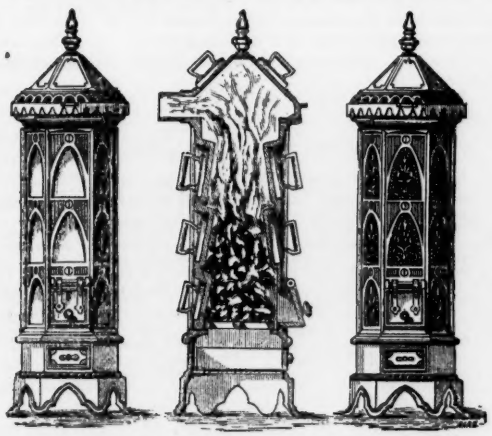
We give here, week by week, a terse description of such of the many inventions as we think may be of use to our readers. Where it is possible, the number of the patent is quoted, to enable those who desire fuller information to procure the specification from the Patent Office in Cursitor-street, Chancery-lane. We shall, generally speaking, confine ourselves to the more recent inventions; but it often happens that an article comes under our notice which, although not quite novel, is worthy of mention for its utility and ingenuity. In such a case we should not hesitate to refer our readers to it. And while we thus increase the interest of our pages, we at the same time assist the inventors by giving greater publicity to their inventions (KNOWLEDGE being a popular magazine) than is accorded by the most excellent trade journals.

FLOATING BREAKWATER.

[Patent No. 5,401. 1884.]—This invention, by Mr. J. P. Moss, of Winchester, consists of a breakwater formed so as to float on the surface of the sea, and attached on the side from which the waves may be expected to buoys or cables moored to the bottom of the sea. The breakwater itself consists of a number of small boys to be so fastened together that each may float on the water. Each wave, on passing through the breakwater, will, it is claimed, gradually lose its crest or upper portion until it emerges to the leeward of the breakwater reduced to a comparatively harmless size. In placing the breakwater in position, space can be left for ships to pass through in order to get to or from the leeward of the breakwater, but in cases of emergency ships could be allowed to drive over the breakwater, and would thereby do but little damage compared to the importance of saving life and cargoes, as well as the ships themselves.

COMBINATION LAUNDRY AND HOT-AIR STOVE.

[Patent No. 2,056. 1885.]—This stove is patented by Mr. Southall, and manufactured by Messrs. Hardy & Padmore. Its use in the laundry is for heating irons, which are placed in tiers around it, as shown in the sectional view. The recess provided for each iron is made to slope inwards towards the fire, thereby obtaining a quicker and more direct heat on the face of the iron, and rendering



it less liable to be knocked off. The irons are, indeed, securely held, although easily lifted off for use. A large number of irons are provided for at one time, as the recesses are placed on all sides of the stove. The two outer drawings show the exterior as arranged in the one case for the irons, and in the other as a hot-air stove, by the simple addition of a loose perforated panel fitted into each recess. The combustion is under control by a sliding-door at bottom, the fire being charged at a hinged door in the top. The stove has an elegant appearance, which will doubtless help to commend it.

BILL AND PRUNING-HOOK.

[Patent No. 7,095. 1884.]—This tool, by Messrs. Norris & Sons, of Stourbridge, is arranged so as to have cutting-edges on all sides, to answer the purpose of bill, pruning, and trimming hook, slasher, spud, and wood-chopper. It consists of a long steel blade, fitted into a serviceable handle, and gardeners and farmers should find it of service. With strength and durability it combines extreme lightness.

AUTOMATIC GATE OPENER.

[Patent No. 10,982. 1884].—Mr. H. V. Rudston Read, of Messrs. Bowes Scott & Read, Broadway Chambers, Westminster, has lately brought out a patent for automatically opening and shutting gates. By means of these improvements a road-gate can be made to automatically open and close on the approach and passing of a wheeled-vehicle, and, when applied to gates of railway crossings, they can be opened and closed from a signal-box or other convenient position, near or distant. The gate is governed by a small lever, with treadles fixed at such a distance that, after a vehicle has passed them, there is yet room for the gate to open. The vehicle is driven so that one wheel shall push down and pass over the upstanding part of the treadle. Then, by means of a bar and lever, the gate is thrown out of the vertical plane, and will swing open of itself, until passing through an angle of 90° it will hang true again, and then remain open. The vehicle then passes the gate and is driven over the second treadle, which acts in the same way as the first, and causes the gate to close of itself.

Factory or office or other doors may be worked in the same manner.

Our Chess Column.

BY MEPHISTO.

THE BRITISH CHESS ASSOCIATION.

THE Council of the B.C.A. have made strong and praiseworthy efforts to make their first meeting a success. The programme is drawn up on a liberal scale, and contains as the chief event an even tournament, open to all comers, besides several interesting minor events. In the tournament—which began on Monday last—the following sixteen players are competing:—Bird, Donnisthorpe, Gunsberg, Guest, Hewitt, Mills, MacDonnell, Mortimer, Loman, Mackeson, Pollock, Rabson, Reeves, De Soyres, Wainwright, and Rumboll. The presence of three first-rates, while raising the standard of play, and consequently, also, the public interest in this event, has not had the effect of reducing play to a dull level. In the first thirty games played, there was hardly any instance of close games being deliberately chosen, the only exception being Bird, who plays the Sicilian as second player.

In the first day's play Mr. Donnisthorpe won a hard-fought game against the Rev. MacDonnell, the former player conducting the end game in masterly manner. Mr. Loman, a young player possessing great natural talent for the game, won a very fine game of Mr. Mills, of which we give the end.

On Tuesday the Rev. J. De Soyres drew against the Rev. MacDonnell in creditable fashion, Mr. De Soyres having ventured upon the counter-attack of the two Knights defence. A well-played game occurred between Messrs. Gunsberg and Pollock, the former player choosing the début of the Centre Gambit. Donnisthorpe continued victorious, playing well against Pollock.

Altogether the tournament proceeds in a most satisfactory manner, the public interest in it being evident by a large attendance of spectators. Play takes place in a good room furnished by Simpsons, in the Strand, and is carried on both in the afternoon and evening. Amongst the daily press we mention the *Standard* and *Echo* as likely to supply current information.

The score, including Tuesday night's play, stood as follows:—

H. E. Bird	4	R. Loman	1
W. Donnisthorpe	3	W. W. Mackeson, Q.C.	0
J. Gunsberg	2	W. H. K. Pollock	1
A. Guest	2	R. Robson	0
T. Hewitt	1	H. A. Reeves	1
D. Y. Mills	0	Rev. J. De Soyres	2½
Rev. G. A. MacDonnell	1½	G. E. Wainwright	1
J. Mortimer	2	A. Rumboll	0

Some of the above players have played more games than others.

The following termination of a game, referred to above, played on the first day of the British Chess Association's Tournament,

between Messrs. R. Loman and D. Y. Mills, will doubtless be of interest to our readers :—

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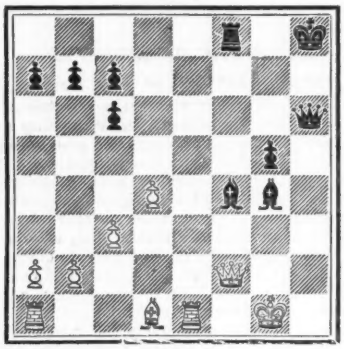

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	B to R6
B to B3	P to Kt5
B to K4	P to Kt6
Q to K2	B to K6 (ch)
Q × B	R to B8 (ch)
resigns.	

Black mates in four moves.

Game played June 15, 1885.

KB OPENING.

White. T. Hewitt.	Black. J. Gunsberg.	White. T. Hewitt.	Black. J. Gunsberg.
1. P to K4	P to K4	23. P × Kt	R to Q7
2. B to B4	Kt to KB3	24. Q to Kt3	Q to Kt3
3. Kt to QB3	B to B4 (*a*)	25. R to B2 (*h*)	R × R
4. P to Q3	P to B3	26. K × R	Q × P
5. Kt to B3	P to Q3	27. R to K sq.	Q to B4 (ch)
6. B to Q2	B to K3	28. K to Kt sq.	R to Q sq.
7. Kt to QR4	B to Kt3 (*b*)	29. R to KB sq.	Q to Kt3
8. Kt × B	P × Kt	30. P to QR4	R to Q7
9. B to Kt3	QKt to Q2	31. R to B2	R × R
10. Kt to Kt5	Kt to B sq.	32. K × R	QtoB4(ch)(*i*)
11. P to KB4	P × P	33. K to Kt sq.	P to K5
12. B × P	P to R3	34. P × P	Q × P
13. Kt to B3 (*c*)	Kt to Kt3		
14. B to Q2	P to Kt4		
15. P to B3 (*d*)			

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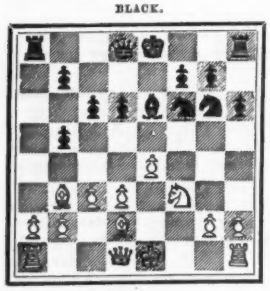

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15.	Castles
16. P to KR3	B × B
17. Q × B (*e*)	Kt to K4
18. Kt × Kt	P × Kt
19. Q to B2	Q to Q3
20. Castles (KR)	QR to Q sq.
21. R to B3	Kt × P (*f*)
22. B × P	Q × B (*g*)

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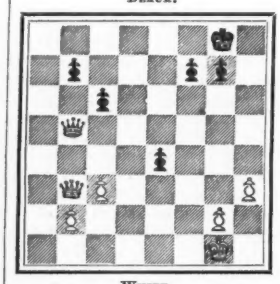

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35. Q to Q sq. (*j*)	Q to Q4
36. Q to K2	P to KB4
37. P to B4	Q to Q5 (ch)
38. K to B sq.	K to B2
39. P to QKt4 (*k*)	K to K3
40. P to Kt5	K to K4
41. P × P	P × P
42. K to K sq.	P to Kt4
43. P to R4	P × P
44. Q to R5	Q to Kt8 (ch)
45. Resigns	

NOTES.

(*a*) Kt × P is a perfectly legitimate continuation, Black need not be afraid of 4. B × P (ch), K × B. 5. Kt × Kt, P to Q4. 6. Q to B3 (ch), K to Kt sq. 7. Kt to Kt5, Q to Q2, and after a few moves Black will obtain a good development.

(*b*) A tempting but a less good move would be Kt × P. White would reply 8. B × B, Kt × P. 9. Q to K2, Kt × R. 10. Kt × B, and White will remain with a good game.

(*c*) White loses important time by this move. He ought to have played Kt × B, which would have left him with two Bishops against two Knights, with a good prospect for the End Game.

(*d*) This move weakens White's game, as will be seen. He might have played 15. B to B3 instead. As the QP could not advance (the KP being attacked), and as further, Black, by a timely exchange of Bishops, would force away the Q from Q sq. (owing to the open R file), P to B3 created a weakness in White's game.

(*e*) If P × B, Black plays R × R.

(*f*) This move gives Black the better game.

(*g*) This forms an important part of Black's plan. If Black had played Kt to B4 instead, then White could play P to Q4, which might lead to a less decisive position than actually arrived at by Black.

(*h*) There is nothing better.

(*i*) This move has an important bearing on the End Game, as it forces the K to retire to Kt sq.

(*j*) If 35. Q × Q, P × Q. 36. P to KKt4, Black wins by P to B4.

(*k*) After Q to R5 (ch), K to B3, Black can easily get out of check, while White's position would be weakened.

Game played 16th inst.

As a contrast to the heavy play of the above game, we give the following lively partie, from which it will be seen that Mr. Mortimer is still to the fore, as powerful and brilliant as ever.

KIESERITSKY GAMBIT.

White. W. Mackeson, Q.C.	Black. J. Mortimer.	White. W. Mackeson, Q.C.	Black. J. Mortimer.
1. P to K4	P to K4	11. Kt to B2 (*d*)	Q to Kt6
2. P to KB4	P × P	12. Kt to Kt4 (*e*)	B × Kt
3. Kt to KB3	P to KKt4	13. R × B	B × B (ch)
4. P to KR4	P to Kt5	14. Q × B	Q × R
5. Kt to K5	P to Q3 (*a*)	15. K to Kt sq.	Kt × P
6. Kt × KtP	B to K2	16. Q to Q2	Kt to B6(ch)(*f*)
7. B to B4 (*b*)	B × P (ch)	17. P × Kt	R to Kt sq(ch)
8. K to B sq.	Q to Kt4 (*c*)	18. K to B sq.	Q to R6 (ch)
9. B to K2	QKt to B3	19. K to K sq.	R to Kt8 (ch)
10. P to Q4	KKt to K2	20. K to K2	Q to B8 mate

NOTES.

(*a*) An old defence. Either Kt to KB3 or B to Kt2 are preferable.

(*b*) We prefer 7. P to Q4, B × P (ch). 8. Kt to B2, &c.

(*c*) This move gives Black a strong game.

(*d*) Apparently in fear of R to Kt sq.

(*e*) This loses. White would have done much better to take the B at once.

(*f*) A move which finishes off the game in a pretty manner.

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